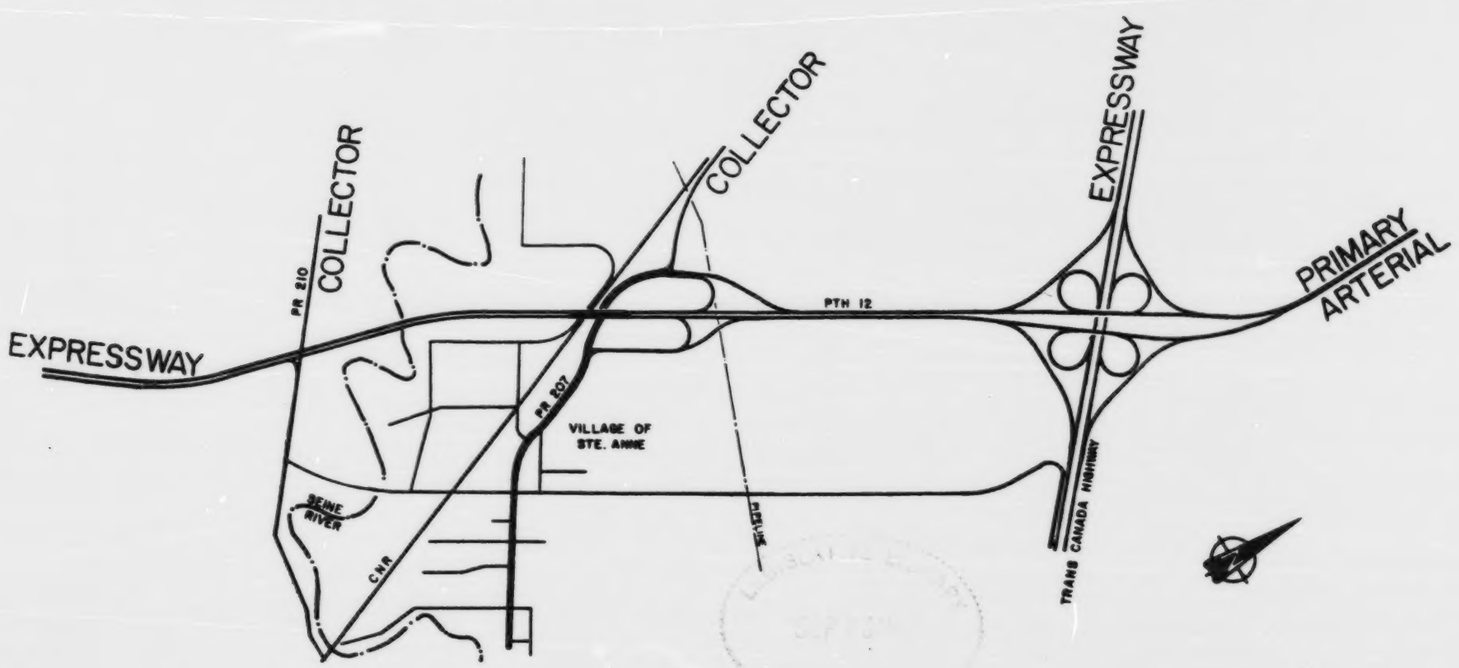
ATTACHMENT #1 C-3

MANITOBA HIGHWAYS
CLASSIFICATION STUDY



Manitoba
Highways and
Transportation

Highway Systems Planning
14th Floor-215 Garry Street
Winnipeg, Manitoba R3C 3Z1

March, 1986

MANITOBA HIGHWAYS
CLASSIFICATION STUDY

Amar Chadha, P. Eng.
Systems Planning Engineer

T. Stevens

Tim Stevens, P. Eng.
Acting Executive Director,
Planning, Design & Land Surveys

Boris R. Hryhorczuk, P. Eng.
Deputy Minister

Manitoba
Highways and
Transportation

ACKNOWLEDGEMENTS:

The assistance and guidance received from a large number of individuals within the Department, particularly District staff, is gratefully acknowledged in undertaking this study. Special thanks are due to R. Holowaty, P. Lehman and D. Miller for the drafting and to L. Shine and J. Todoruk for the word processing.

DISTRIBUTION:

Hon. John S. Plohman, Minister of Highways & Transportation
B.R. Hryhorczuk, Deputy Minister of Highways & Transportation
S. Goodbrandson, Ass't Deputy Minister, Construction & Maintenance
D. Struthers, Director of Construction
M. Corkal, Construction Management Engineer
B. Rowley, Director of Maintenance
B. Tinkler, Maintenance Management Engineer
G.A. De Pauw, Director of Bridges & Structures
R.C. Blackman, District Engineer, Selkirk, Manitoba (2)
B.W. Prentice, District Engineer, Steinbach, Manitoba (2)
R.R. McKibbin, District Engineer, Carman, Manitoba (2)
H. Morningstar, District Engineer, Boissevain, Manitoba (2)
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R. Adamson, Traffic Engineer
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A.A. MacLeod, Continuing Studies Engineer
R. Nichol, Administrative Officer
L. Fouillard, Traffic Studies Engineer
Senior Planning Engineer
A. Chadha, Systems Planning Engineer
J. Romeo, Development Review Engineer
D. Lam, Senior Programming Engineer
A.B. Boychuk, Senior Design Engineer
J. Wallace, Acting Executive Director, Transportation Policy, Programs & Research

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BRYAN K. JOHNSTON, P. ENG. - A TRIBUTE

This study is dedicated to the memory of Bryan Keith Johnston in recognition of his great contribution to its undertaking and to the safe and efficient movement of highway travellers in the Province of Manitoba.

Bryan was born in Winnipeg in 1936. He graduated from the University of Manitoba in 1958 and earned a Masters Degree at the University of California - Berkeley in 1960. He embarked on a career with Manitoba Highways as a planning engineer in 1960, which came to an end after 25 years by his untimely death on December 30, 1985.

During his time with the Department, Bryan witnessed a tremendous growth in the highway system within the Province. In response to this need, he developed a computerized method for the inventory and appraisal of the condition of the Trunk Highway system and for identifying those portions of highway requiring upgrading. He was also responsible for the planning and programming of the Provincial Road system. Bryan was very aware of the national importance of highways. When he first graduated, he worked on the construction of the Trans Canada Highway through Banff National Park and, as Planning Engineer and later Executive Director of Planning, Design and Land Surveys with Manitoba Highways & Transportation, he actively promoted the upgrading and strengthening of important interprovincial routes such as Trans Canada and the Yellowhead.

The first comprehensive engineering study of long-range highway needs in Manitoba was completed with the assistance of the Automotive Safety Foundation in 1960. With the incorporation of many miles of municipal and main market roads into the provincial system in the mid nineteen sixties, an update of the 1960 study was evidently required. However, the resources to carry out such a study did not become available until the nineteen eighties when, following metrication of the Department's basic design standards, the present classification study was undertaken. The staff who have worked on it owe much to the enthusiam and direction of Bryan, and so, although it is being finalized after his death, it seems very fitting to dedicate it to his memory.

Bryan was a conscientious and hard working professional engineer who was firmly committed to the goal of technical excellence. He was also a friend to all those who worked for and with him. He will be long remembered with affection by his colleagues.

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AADT = Annual Average Daily Traffic

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Exhibit A	-	Provincial Highways Functional Classification Map		Back Envelope
Exhibit B	-	Provincial Highways Design Cross-Section Map		"

* Copies of this study sent to the District Offices contain only the Classification Map (Exhibits 1 through 12) applicable to that District

1. SUMMARY OF RECOMMENDATIONS: (1)

It is recommended that the **Functional Classification** system as shown on **Exhibit A** be used in conjunction with the existing statutory classification system for provincial highways (Provincial Trunk Highways and Provincial Roads). The **District Maps** showing the **proposed functional classifications** are shown on **Exhibits 1 to 12** inclusive.

The recommended relationship between Provincial Trunk Highways and the proposed highway classification system is that all arterial and expressway routes be defined as either existing or future Provincial Trunk Highways, depending upon the existing status and condition of the highway. Future Provincial Trunk Highways will likely be those arterials that are not, at present, in existence or built to acceptable standards. For future Provincial Trunk Highways, adequate development and access control procedures should be put in place as soon as possible to allow for future construction or upgrading of the highway to Provincial Trunk Highway standards.

With the adoption of the proposed highway classification system, it is further recommended that the proposed **Basic Design Standards in Table 1** be used. **Exhibit B shows the Design Cross-section Map** which is based on the application of Table 1 (Basic Design Standards) to Exhibit A (Proposed Highway Classification) for the entire province. The **cross-sections** used for the map (Exhibit B) are shown on **Drawings 1 to 6** inclusive. The cross-section map shows preliminary cross-section proposals for all provincial highways and is based on 1984 traffic volumes and current estimated growth rates for the next 20 years (to 2004). It is recommended that this cross-section map be used to establish basic number of lanes and shoulder widths; further investigation taking into account local development, local terrain, socio-economic trends, soil, drainage and other existing conditions must be made before adopting a specific overall cross-section. This cross-section map should be reviewed at least once every five years.

It is recommended that the pavements for all expressways (multi-lane divided highways) and arterials be upgraded where necessary to withstand single axle loads of 9100 kg; collector highways should be designed to accommodate single axle loads of 8200 kg. Elimination of spring restrictions should also be a priority on all arterials.

For **access control**, it is recommended that **Table 2** be used as a guide for reviewing and granting accesses. The criteria for spacing of accesses given in Table 2 should be adhered to in order to maximize the service life of the highway facility. Only in exceptional circumstances, should these spacings be reduced. It is recommended that a systematic approach be used for granting accesses. For the lower classification collector routes, access control may be relaxed (providing safety is maintained) and for arterials, access control should be more rigorous. It is also recommended that a review be undertaken of development **control lines** and intersection **control circles**, taking into account the recommended highway classification system. The need for this review is immediate.

2. BACKGROUND:

(i) General

The principal purposes of road classification * are to:

- establish logical, integrated systems composed of all roads and streets which, because of their service, should be administered by the same jurisdiction
- provide a basis for assigning the responsibility for each class of road to the level of government with the greatest interest
- group roads and streets that require the same quality of construction, maintenance and operation

A classification system provides guidance to the highway authority in the following areas:

(a) **Administration** - roads with similar construction, maintenance and operational needs can be grouped; also a basis is provided for assigning statutory and departmental responsibility

(b) **Planning and Design** - a systematic approach can be used for controlling land use, access, subdivisions and other developments adjacent to highways in order to ensure public safety and mobility and also to protect the costly investment in the highway system; also a guide is provided to ensure consistency in geometric design standards for similar classes of highways

* See "Geometric Design Standards for Canadian Roads and Streets" by the Roads and Transportation Association of Canada (RTAC) 1976

(ii) Need for Study

This in-house study has been undertaken by the Highway Systems Planning Section with considerable input from the District Engineers and other staff. There has been a need to update the last study which was completed (with the assistance of the Automotive Safety Foundation) in December 1960. This earlier study, "Manitoba Highways, Planning for Tomorrow" was the first comprehensive engineering study of long range highway needs done in Manitoba and included desirable and minimum design standards for five classes of Provincial Trunk Highway (the class number was dependent on the projected average daily traffic). After this study was completed, provincial highways were further divided into two statutory categories, i.e., Provincial Trunk Highways (PTHs-six design classes) and Provincial Roads (PRs-four design classes). Provincial Roads mainly consist of former municipal roads and main market roads taken over by the Province in the mid nineteen sixties. While the above design classification system served Manitoba well, it was necessary, in conjunction with metrication, to consolidate design standards and highway classes and this resulted, in November 1980, in the adoption on an interim basis of five PTH design classes and two PR design classes (these interim standards were also directly related to projected average daily traffic).

2. **BACKGROUND:** (cont'd)

The proposed highway design classification system is very similar to the one proposed by the Roads and Transporation Association of Canada and separates different types of highways on the basis of land service, traffic service and traffic use. Incorporation of all these functions makes the proposed classification useful for planning, programming, design, and operational purposes.

The need for a review of the highway classification system is further underscored by changing public and government attitudes towards transportation, the environment and recreation. The transportation of hazardous (dangerous) goods is a growing concern as are noise, air and soil pollution. The safety of cyclists using the highway system is another topical concern.

The development of newer transportation technology has led to a demand to accommodate heavier and longer trucks and trailers, and the conservation of energy has led to the development of smaller and lighter cars. The abandonment of rail branch lines in some areas has resulted in more grain being transported on roads, while transportation of liquids (such as oil) by pipelines instead of trucks has reduced some truck traffic in oil producing areas.

The development of new mines has generated a need for new roads, and abandonment of mines may have made some roads redundant. The trend for rural populations to move to urban centres has altered the traffic patterns on many roads.

The above factors, coupled with the present financial constraints, make the need to review the present classification system very necessary so that spending can be concentrated on high priority projects. The limited funds available for highway construction and maintenance have to be carefully budgeted to satisfy increasing transportation needs and demands. With no significant increase in highway funding likely it was felt necessary to reassess the fairly high standards currently used for the lower classification, lower volume highways. Savings in construction and maintenance on these lower classification highways (without compromizing safety) can then be diverted to the higher classification higher volume highways.

3. **STUDY OBJECTIVES:**

Some of the primary objectives of this study were to:

- ensure the safe, efficient and economical operation of the existing and future highway network in the Province, including interprovincial and international links

- ensure that all significant Manitoba communities, resource areas, recreational areas and other strategic nodes are provided with all-weather highway service providing connection with other provincial highways or rail, air or ferry service: also that dispersed rural inhabitants have access to transportation within a reasonable distance

- identify the need for and location of new links and the need for capacity and safety improvements on existing links, based on existing deficiencies, traffic growth or economic development

- protect the considerable provincial investment in highways already in place

- maintain a safe and efficient relationship between highway users and the users of adjacent land

- classify the highways in the Province into groups on the basis of the importance of their role in servicing through traffic or providing access to land

- ensure that appropriate and practical standards are used which reflect the relative importance (from a functional and traffic volume perspective) of the highways that comprise the provincial network

- review standards with the objective of reducing land consumption required for highway right-of-way, particularly in prime agricultural areas

3. **STUDY OBJECTIVES:** (cont'd)

In order to achieve the above objectives, it was felt necessary to conduct a study which would:

- develop a highway classification system (similar to RTAC) for Manitoba that incorporates land service, traffic service and traffic use - to be integrated if possible with the present statutory classification system (PTHs and PRs)

- assess present and future requirements on the provincial highway system over a 20-year period

With respect to the lower classification highways, the Department had received a mandate ("Meeting our Highway Needs", December 1983) as follows:

"First, those Provincial Roads forming the principal secondary road network...will be upgraded to a standard slightly lower than that utilized today and second, a level of Provincial Roads which largely serve as local access roads and minor connections...will be at a lower standard than the principal Provincial Roads.

4. **STUDY APPROACH:**

(i) **Methodology**

The first task was to define highway classes. The RTAC definition of classification was modified slightly to suit the situation in Manitoba **(see Definitions, Schedule 1)**. The next task was to establish the class ranking of the highway system. This was done by defining those nodes which the highway system will link.

The nodes used to define the **expressway** links (multi-lane divided highways), the **arterial** links and the **collector** links included population centres, recreation centres, resource extraction areas and other areas of major economic activity.

Having established the larger nodes, the expressway and arterial highway network was first determined. The linkages between the larger nodes formed this network. In cases where more than one highway joined nodes, the most viable link was selected. This process was repeated for all the nodes and classes of highway until the complete highway system network was developed. The arterial highway classes were broken into two, namely **primary arterials** and **secondary arterials**. Primary arterials are the more important links because they provide interprovincial and international connections and direct service to the most important population centres. Secondary arterials connect less important centres. It was felt that as the aim of the Department is to serve the Province at large, no "local" classification should be included. Local roads are in most cases considered a municipal responsibility. The collector roads were subdivided into three types, **Collector A , Collector B and Collector C.** Collector A is the highest ranking and Collector C is the lowest ranking road in this system. The ranking was again based on the size of the population and recreation centres or the importance of the resource areas served. The breakdown of these classes of collectors is mainly required for subdivision, access control and operational purposes.

On completion of the network, each linkage was re-examined, evaluated and in some cases upgraded or downgraded due to special conditions. Input received from the District Engineers and others was important in this regard.

4. **STUDY APPROACH:** (cont'd)

(ii) **Nodes**

The three basic nodes that were selected were population nodes, recreation nodes and resource nodes:

(a) Population nodes

These included cities, towns, villages and Indian reserves. The most viable highway linking the population nodes were defined as follows:

Link classification	Connecting population nodes
Expressway and primary arterial	Greater than 10 000
Secondary arterial	1000 to 10 000
Collector A	500 to 1000
Collector B	50 to 500
Collector C	Less than 50

(b) Recreation nodes

These are areas of major recreational activity such as parks and recreation centres. The major traffic to these nodes is during the summer months. In view of this, the nodes are defined in terms of visitations to these areas during the four summer months (June to September).

Linkage Classification	Connecting recreation nodes (summer visitors/year)
Expressway and primary arterial	Greater than 30 000 visitors
Secondary arterial	15 000 to 30 000 visitors
Collector A	8 000 to 15 000 visitors
Collector B	2 000 to 8 000 visitors
Collector C	Less than 2 000 visitors

(c) Resource nodes

These nodes included mining resource areas, hydro power sites, oil drilling sites and major fisheries centres. The nodes included those places where the resource exploitation is underway or is anticipated to commence within the next five years.

In cases where the prime purpose of the highway is simply to connect the resource area to the highway system the road is classified under the collector classification.

4. **STUDY APPROACH:** (cont'd)

(iii) **Design Standards**

The current **"Interim Basic Design Standards"** used by the Department are essentially based on projected traffic volumes regardless of the functional classification of the highway. This concept has served fairly well in the past but with the increasing volumes of traffic plus land development pressures along arterial routes, it is necessary to relate design standards to not only the traffic use but also the anticipated service to land in the highway corridor. Manitoba has its own unique character due to the very flat terrain in the south, the very sparse population in rural areas, and the very large concentrations of population in and around Winnipeg. Large areas of farmland abutting highways in the south and extreme variations in summer and winter conditions also require special consideration in design standards.

The purpose of any highway system is to provide for adequate traffic flow as well as suitable land access. Experience has shown that land access and through traffic movement are operationally in conflict. It is therefore necessary to separate these two functions. This in turn leads to the development of various types of highway systems where the primary functions are:

a) to provide for the optimum movement of through traffic, through the restriction of direct property access - expressways and arterials
b) to provide equally for the movement of traffic and for land access through partial control of property access - collectors
c) to provide only for land access - locals

Present design standards (Interim Basic - see **Figure 1**) are based on projected traffic volumes irrespective of the type of traffic and land service. Clearly there is a need to develop design standards related not only to projected traffic but also to the functional classification which takes into account the degree of land access being provided for.

Surface treatment (generally, at least base and asphalt surface treatment) is presently recommended at 20-year volumes over 250 vehicles per day (v/d).

In view of the current economic constraints, it was felt the Department should relate the current design standards to the functional classifications in a manner that would raise the standards slightly for the higher classifications and drop the standards slightly for the lower classifications. It was also felt economies could be realized by raising the warrant for surface treatment to a higher 20-year volume than 250 v/d.

4. **STUDY APPROACH:** (cont'd)

(iv) **Growth Rates**

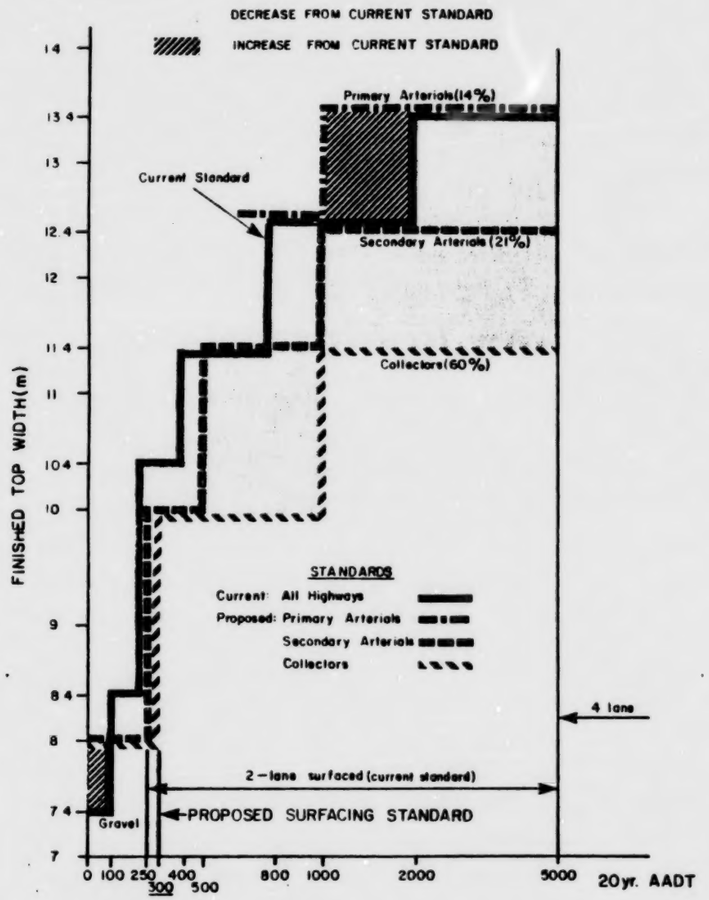
Historic traffic growth rates around the Province vary somewhat by geographic region. The study of past trends has previously been used to predict future traffic volumes. However, the accuracy of predicting future traffic using past traffic counts has been limited by such factors as the energy crisis of the early nineteen seventies, the economic recession of the early nineteen eighties and other socio-economic changes that have affected not only travel patterns but also transportation technology. Future traffic may also be estimated by taking into consideration any likely increase in provincial population, the number of vehicles per capita and the average use of each vehicle, plus the highway use attributable to out-of-province traffic.

With the 1978 exodus of population out of Manitoba to other provinces and the recent recession, the historic growth rates have been disturbed. The rapid growth in traffic volumes on roads and in Manitoba's economy in the 1950's and 1960's is no longer taking place. The pace of growth is much less now and for one to assess the growth rate realistically, it is appropriate for future considerations to be based on trends in the last 5-10 years and no longer.

The travel kilometres on PTHs and PRs is shown on **Figure 2.** The present growth rates used on many highways by the Department are now very unrealistic, and they have therefore been examined by Continuing Studies Section so that more appropriate values can be adopted for planning and design purposes.

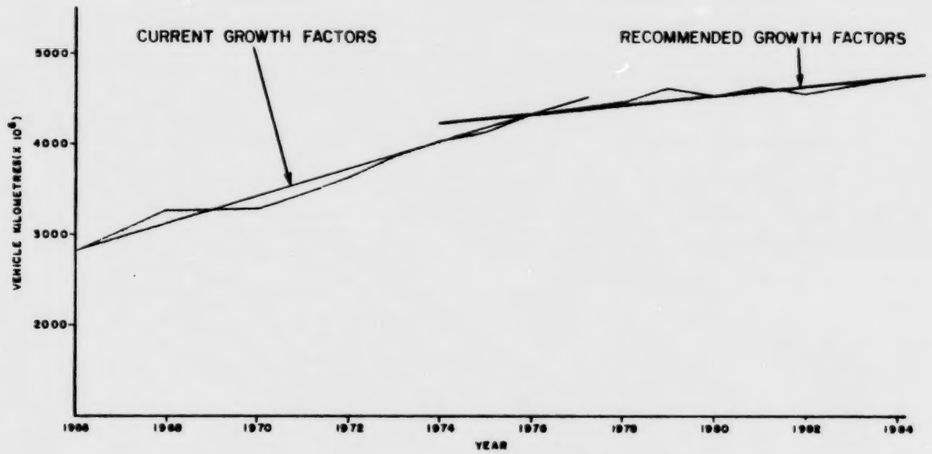
(v) **Speed**

The design speed of a road is a value selected to correlate the geometric features to ensure compatibility with terrain, the nature of roadside development it serves and anticipated traffic characteristics. The design speed affects the quality of service, safety, cost and environmental impact of the facility. Once the road is constructed, the design speed is a permanent feature which cannot be altered without extensive reconstruction. Thus the selected design speed should be as high as practical in the interest of safety and service, but should be compatible with the terrain, surface, roadside development and cost.



COMPARISON OF CURRENT & PROPOSED DESIGN STANDARDS

FIGURE 1



TRAVEL ON PROVINCIAL HIGHWAYS(RURAL) 1966 - 1984

FIGURE 2

4. **STUDY APPROACH:** (cont'd)

Some authorities relate posted speed to design speed and a value of posted speed 16 km/h (10 mph) less than design speed is a common criteria. While this may be a valid means of selecting posted speed assuming design speed is well chosen, the reverse should be avoided. It is therefore necessary for the design speed to be based on the function of the highway and on prevailing conditions; not on posted speed. In the past posted speeds were lowered due to energy conservation and recently the Province has come under pressure to raise speed limits on some highways. Posted speed may be changed after a road is built and drivers' adherence to it tends to be related to the quality of enforcement, a variable beyond the control of the design engineer. The question of maximum value of design speed cannot readily be deduced. On classifying the road, the design speed selected is usually a reflection of terrain and cost. Normally this selection is done by posing the question "What speed will a driver select under the most favourable road, traffic, climatic and vehicular conditions?". RTAC for its highest classifications suggests a maximum design speed of 140 km/h.

The design speed thus depends largely upon the function of the highway. Where the function of road is primarily traffic flow the speed is high and where the function of the road is to provide for land access and traffic flow, the speed will be less.

Design speeds used at present need to be examined and new design speeds, if any, recommended to suit modern road and vehicular requirements.

(vi) <u>Access and Land Use Control</u>

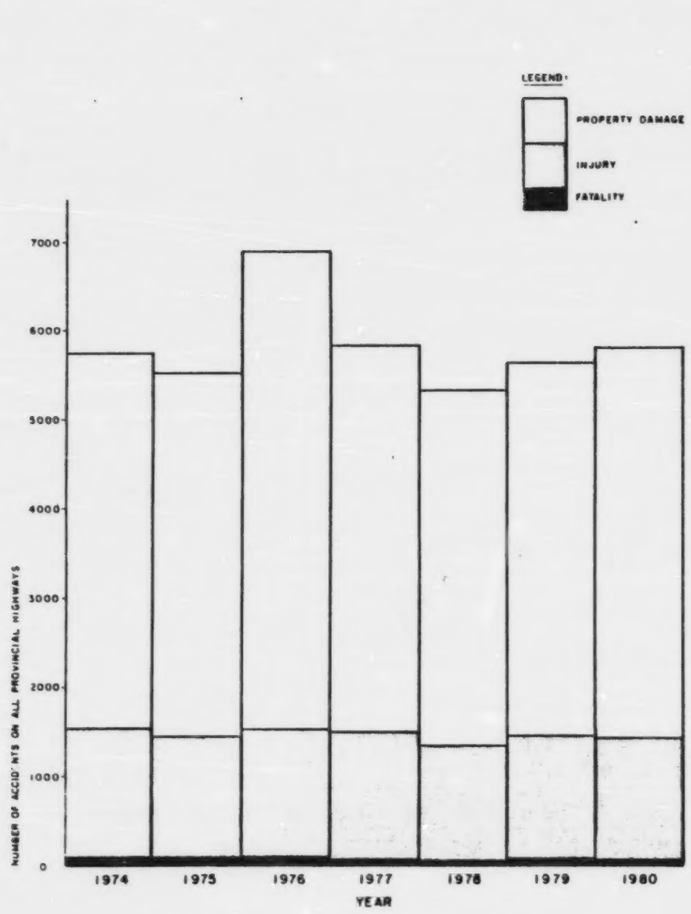
To protect the highway user and to preserve the highway investment, controls are exercised by the Department over land use, zoning, buildings and accesses adjacent to provincial highways. The land use control is carried out through development plan, zoning and subdivision review in conjunction with the **Department of Municipal Affairs. Provincial Land Use Policy No. 12** adopted in 1980 sets out the Department of Highways & Transportation objectives and controls on land use in the highway corridor. The policy states that "new development should be restricted in the vicinity of provincial highways so as to avoid any interference with the main function of this regional transportation network". The policy restricts development that would cause significant interference within a distance of about

4. **STUDY APPROACH:** (cont'd)

300 m (1000 feet) from the centre line of major provincial highways (this distance is one-half mile at intersections with other provincial highways). Compatible land uses (such as agriculture or wayside parks) are permitted adjacent to major highways provided that individual parcels do not measure less than about 300 m (1000 ft.) in width of highway frontage. The policy does not permit strip development along highways. Certain criteria are also established for those highways where planned development is permitted.

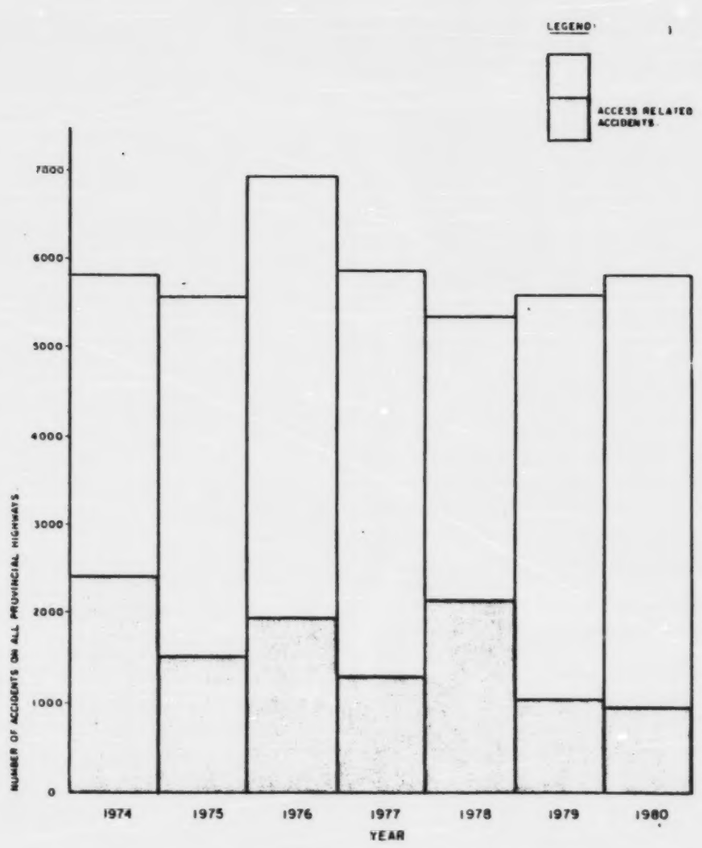
The accesses, buildings and structures adjacent to provincial highways in Manitoba are controlled and administered under two acts, namely **"The Highways and Transportation Department Act"** and **"The Highways Protection Act"**. Limited access controls are provided by the Highways and Transportation Department Act; more comprehensive controls are provided by the Highways Protection Act. Under the Highways & Transportation Department Act, controls are exercised within about 40 m (125 ft) of the edge of highway right-of-way. All PTHs (and some PRs) are covered by the Highways Protection Act and controls are exercised within about 40 m to 75 m (125 ft to 250 ft) along the highway and within circles varying in radius from about 100 m to 450 m (350 ft to 1500 ft) at key intersections.

The accidents on all provincial highways are shown on **Figure 3.** In Manitoba, records have indicated that there are about 40% fewer accidents on access controlled highways than on non-controlled highways **(Figure 5).** It is also noted that 20% of all accidents are approach related **(Figure 4).** There appears to be a relationship between the number of accidents and the severity of the winter **(Figure 6).** In the years the Province experienced severe or long winters there was a marked increase in the number of accidents. With full control of access, four-lane divided highways are generally safer than two-lane highways since medians decrease the effects of accidents. Curvature, gradient, intersections, accesses and structures increase the effect of accidents, intersections being the most dominant element and gradient being the least significant. Experience has further shown that unlimited numbers of accesses on highways can contribute to congestion and a reduction in basic capacity, thereby shortening the useful service life of the facility. An increase in access points leads to strip development which causes the public to ask for speed reductions, traffic signals, cross-walks, etc. This study needs to relate desirable access spacing to the function of the highway.



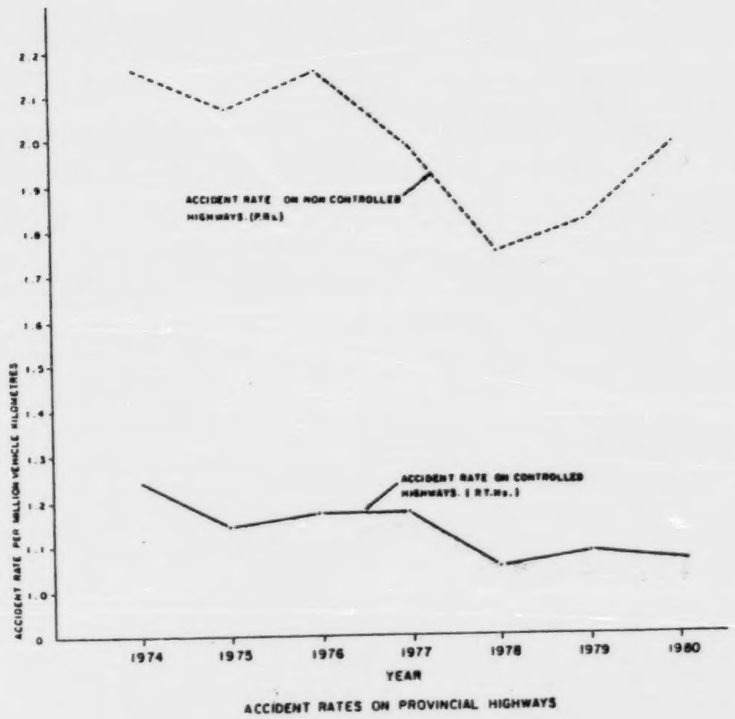
ACCIDENTS ON ALL PROVINCIAL HIGHWAYS (1974 - 1980)

FIGURE 3



ACCIDENTS RELATED TO ACCESS OF TOTAL ACCIDENTS ON ALL PROVINCIAL HIGHWAYS 1974 - 1980

FIGURE 4



ACCIDENT RATES ON PROVINCIAL HIGHWAYS

FIGURE 5

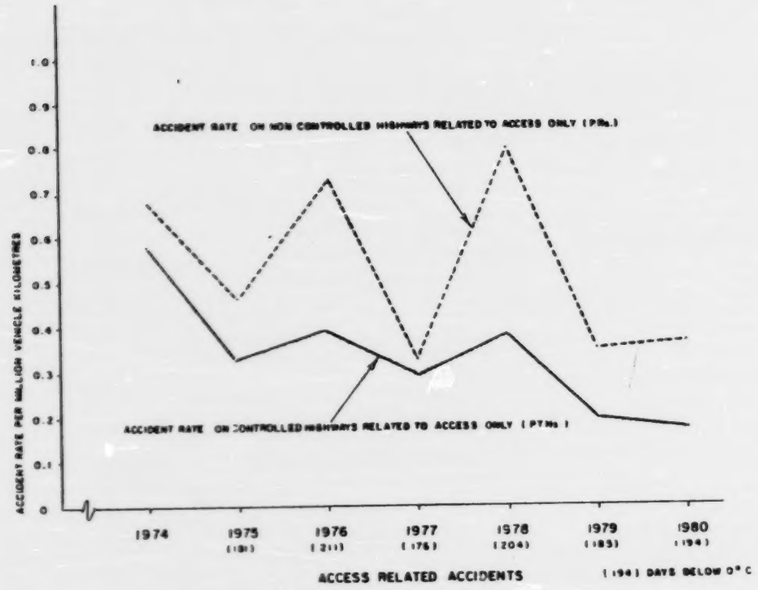


FIGURE 6

5. CONCLUSIONS AND RECOMMENDATIONS:

(i) Functional Classifications

It is recommended that the functional classifications as shown on **Exhibit A** be adopted for highways under provincial jurisdiction. This classification is to be used in conjunction with the existing statutory classification system. The proposed functional classifications are similar to those used by RTAC with the difference that they are based on population and activity nodes and have somewhat lower traffic volume ranges. This slightly different approach takes into account the unique geography, physiography and demography of the Province. The relationship between Provincial Trunk Highways and the functional classifications is that all **arterial and expressway routes are defined either as existing or future Provincial Trunk Highways.** Where arterial routes are already paved and may be readily upgraded to the desired design standards, they may be declared as Provincial Trunk Highways immediately (within the next 5 years). Those arterial routes that are still gravel may remain under the Provincial Road category for now. Procedures should however be put in place that provide for development control along these future Provincial Trunk Highways and they should eventually be transferred to the jurisdiction of the Highway Traffic Board.

If the above recommendations are adopted, then the collector highways should generally be defined as Provincial Roads. (Only in certain exceptional circumstances should the collector highways be considered for Provincial Trunk Highway status.)

It is noted that if the above recommendations are implemented in conjunction with the relevant design standards, there should be consistency in road construction, maintenance and operational standards. There should also be a marked cost reduction because about 80% of highways will eventually be built to a more economical construction standard than existing (see Figure 1). This cost reduction not only relates to construction but also to maintenance spending and should eventually result in considerable savings. Adoption of the classification system and the revamped design standards should also facilitate highway planning, programming and land management along highways and the administration of funds within the Department's budget.

Individual functional classification maps for each district are shown on **Exhibits 1 to 12** inclusive.

BASIC DESIGN STANDARDS FOR PROVINCIAL HIGHWAYS

(ALL DIMENSIONS IN METRIC UNITS)

Manitoba Highways and Transportation

DESIGN CLASSIFICATION		ESTIMATED 20-YEAR ANNUAL AVERAGE DAILY TRAFFIC												
	EXPRESSWAYS	OVER 5000 (A)												
	PRIMARY ARTERIALS	OVER 5000 (A)	1000–5000 (2)	UNDER 1000										
	SECONDARY ARTERIALS	OVER 5000 (A)		1000 – 5000 (2)		500–1000			UNDER 500 (9)					
	COLLECTORS	OVER 5000 (A)				1000 – 5000 (2)			300–1000			UNDER 300		
DRAWING Nº (CROSS SECTION)		1	2	3		4			5			6		
NUMBER OF LANES		MULTI-LANE DIVIDED (1)	TWO-LANE	TWO-LANE		TWO-LANE			TWO-LANE			TWO-LANE		
TERRAIN (G)		ALL	ALL	FLAT	ROLLING/RUGGED	FLAT	ROLLING	RUGGED	FLAT	ROLLING	RUGGED	FLAT	ROLLING	RUGGED
DESIGN SPEED – km/h		130 (F)	120	120	110	120	110	100	110	100	90	100	90	80
CURVATURE – MINIMUM RADIUS (11)		800 (D)(F)	650	650	525	650	525	420	525	420	340	420	340	250
GRADIENT – MAXIMUM PERCENT (3)		3 (F)	3	3	5	3	6	7	3	6	7	4	7	8
STOPPING SIGHT DIST. – m		260 (F)	240	240	220	240	220	200	220	200	170	200	170	140
PASSING SIGHT DIST. – m (4)		NOT APPLICABLE	800	800	740	800	740	680	740	680	620	680	620	550
SURFACE TYPE		CONCRETE OR BITUMINOUS PAVEMENT	CONCRETE OR BITUMINOUS PAVEMENT	CONCRETE OR BITUMINOUS PAVEMENT		CONCRETE OR BITUMINOUS PAVEMENT			SURFACE TREATMENT (7) (9)			GRAVEL		
LANE WIDTH – m		3.7	3.7	3.7		3.7			3.7 (9)			N.A		
SHOULDER WIDTH – m		2 – 3 RIGHT (10) 1 – 2 LEFT	3.0 (8)	2.5		2.0			1.3 (9)			N.A		
ROADBED WIDTH – m		VARIABLE	VARIABLE	VARIABLE		VARIABLE			VARIABLE (9)			8	8.4	8.4
MEDIAN WIDTH – m	DEPRESSED (5)	12 MINIMUM 20–40 NORMAL	N.A.	N.A.		N.A.			N.A			N.A		
	CURBED (6)	6–10 NORMAL												
RIGHT OF WAY – m		AS REQUIRED	60	60		60			50 (9)			40	45	45
STRUCTURES WIDTHS BASED ON THE ASSUMPTION OF 1.2m INCREMENTS	CLEAR WIDTH m (B) UNDER 60m LONG	PAVMENT PLUS SHOULDERS	13.2	12.0		12.0			10.8			8.4		
	CLEAR WIDTH m (B) OVER 60m LONG	10.8 (C)	10.8	9.6		9.6			8.4			8.4		
	LOADING	MS 225												
	VERTICAL CLEARANCE	ALL 5.0m (ALLOWS FOR 0.1m RESURFACING DEPTH)												

NOTE: IN GENERAL THESE STANDARDS ARE A MINIMUM, TO BE BETTERED WHEN FEASIBLE, BUT TO BE LOWERED WHEN HEAVY ECONOMIC PENALTY RESULTS.

1. FULL CONTROL OF ACCESS WHENEVER POSSIBLE: Nº. OF LANES DETERMINED BY CAPACITY ANALYSIS
2. FOR VOLUMES IN THIS RANGE, USE FOUR LANES WHEN TWO LANES WILL NOT PROVIDE CAPACITY FOR 20-YEAR DESIGN HOUR VOLUME.
3. ON GRADES OVER 3%, NEED FOR TRUCK CLIMBING LANES TO BE CONSIDERED. SEE PAGE D3-41 OF HIGHWAY DESIGN MANUAL.
4. PASSING SIGHT DISTANCE SHOULD BE AVAILABLE ON A MINIMUM 25% OF ANY 2km AND A MINIMUM OF 50% IN ANY 15km.
5. MEDIAN WIDTH INCLUDES THE INSIDE SHOULDER.
6. MEDIAN WIDTH MAY INCLUDE A 0.3 – 0.5m CURB OFFSET.
7. BASE COURSE AND ASPHALT SURFACE TREATMENT OR CALCIUM CHLORIDE ON WELL DRAINED A3 OR BETTER SOILS; HEAVIER PAVEMENT, IF WARRANTED, ON POORLY DRAINED A4 – A7 SOILS.
8. PAVE 0.9m OF SHOULDERS IF 20 YEAR A.A.D.T. OVER 2000.
9. CONSIDER STAGE CONSTRUCTION, IF SURFACE TREATMENT NOT POSSIBLE FOR 5 – 10 YEARS OR IF THE FUNCTION OF THE HIGHWAY SO WARRANTS.
10. SURFACE TREAT OR PAVE 0.6m OF RIGHT SHOULDER FOR EXPRESSWAYS AND ARTERIALS.
11. HORIZONTAL CURVE DATA BASED ON MAXIMUM SUPERELEVATION OF 6%

(A) IN ADDITION TO THE A.A.D.T. OTHER FACTORS SUCH AS HOURLY FLOWS, SEASONAL VARIATIONS, THE FUNCTION OF THE HIGHWAY, ETC., MAY HAVE A BEARING ON THE DECISION TO FOUR LANE. DIRECT PROPERTY ACCESS NORMALLY ELIMINATED ON EXPRESSWAYS.

(B) OTHER FEATURES IN THE VICINITY OF THE STRUCTURE SUCH AS INTERSECTIONS, ROAD CURVATURE, THE NEED FOR A SIDEWALK, ETC., COULD AFFECT THE REQUIRED STRUCTURE WIDTH. CLEAR WIDTH IS " IN TO IN " OF CURBS.

(C) WIDTH OF 2 LANE, 1-WAY OVERPASS. FOR MORE THAN 4 LANE DIVIDED OR FOR UNDERPASS CONSULT PLANNING & DESIGN.

(D) MINIMUM RECOMMENDED RADIUS 1000 – 1200m ON T.C.H.

(E) STANDARDS FOR FRONTAGE / SERVICE ROADS AS PER DRAWING Nº. 5 OR 6 (EXCEPT FOR RIGHT OF WAY REQUIREMENTS.

(F) FOR DESIGN SPEED AND ASSOCIATED PARAMETERS ON MULTI-LANE COLLECTORS CONSULT PLANNING & DESIGN.

(G) USE OF RUGGED TERRAIN STANDARDS MUST BE JUSTIFIED ON BASIS OF SUCH FACTORS AS SIGNIFICANT REDUCTION IN CONSTRUCTION COSTS & ENVIRONMENTAL IMPACTS. ONLY TO BE CONSIDERED FOR LOWER CLASSIFICATION HIGHWAYS WITHIN SUCH AREAS AS THE WESTERN UPLANDS, DEEP RIVER VALLEYS AND THE CANADIAN SHIELD.

March 1986

TABLE 1

5. **CONCLUSIONS AND RECOMMENDATIONS:** (cont'd)

(ii) **Design Standards**

With the adoption of the proposed classification system, design standards are required to reflect these in a practical manner and in a way that continues to ensure a high level of service and safety for the travelling public. The standards adopted should reflect the service aspect of each highway. Allowing for slightly lower standards for secondary arterials and collectors and slightly higher standards for primary arterials, basic design standards were developed.

The proposed **"Basic Design Standards for Provincial Highways" (Table 1)** represent a combination and rationalization of the current "Interim Basic Design Standards" for PTHs and PRs. To avoid confusion, most of the current shoulder widths (3 m, 2.5 m and 2 m) are retained in the proposed standards; however the projected volume ranges for which they apply have been revised upwards or downwards depending on the functional classification. It should also be noted that the minimum shoulder width is now proposed at 1.3 m instead of 1.5 m. The current standards have two gravel roadway widths, 8.4 m and 7.4 m. It is proposed to combine these into a single 8 m width (except in rolling terrain, where 8.4 m will still apply). Whereas the current standards relate cross section width simply to projected traffic the proposed standards relate the cross section to the projected 20-year traffic and the design classification. Figure 1 illustrates the relationship of the proposed and current standards in terms of the overall finished top width of the various classes of highway. The proposed cross-section widths generally fall within the ranges specified by RTAC. The top widths vary depending on the functional class and projected traffic volume on the highway facility throughout its length. The lower the function in terms of traffic movement, the lesser the shoulder width recommended. Thus the maximum shoulder width for 2-lane primary arterials is 3 m, for 2-lane secondary arterials is 2.5 m and for collectors is 2 m. It should be noted that provision of a 2 m ceiling on shoulder width on collectors still allows for two lane operation (2x3.7 m) past a 2.6 m wide vehicle parked on one shoulder - although some encroachment on the opposite shoulder would likely result. For high volume primary arterials (future AADT greater than 2000), the standard was further raised to include a 900 mm (3 ft) paved strip on the shoulder. In the past there has been some demand to provide full width paved shoulders on high volume 2-lane arterials. Provision of the 900 mm paved strip goes some way towards meeting this demand but does in fact have operational advantages over full width paved shoulders as is demonstrated below.

5. **CONCLUSIONS AND RECOMMENDATIONS:** (cont'd)

The cross-sections relating to the proposed standards are shown on **Drawings 1 to 6** inclusive. These cross-sections are very similar to those previously in use by the Department with the following exceptions:

1) Drawings #1 and #2

These allow for incorporation of a paved or surface treated strip on the gravel shoulder - to the right of the travelled lane(s). This strip, which is recommended on higher volume highways, should result in the following benefits:

(a) compared with full gravel shoulders

- increased driver comfort
- improved vehicle passing safety
- reduction in shoulder related accidents
- reduction in shoulder maintenance
- added lateral support leading to increased pavement life
- some allowance for bicycles

(b) compared with full paved shoulders

- increased safety under icy conditions
- reduced construction cost

The method of constructing the paved (or surface treated) strip will be dependent on a number of factors such as whether new construction, reconstruction or resurfacing is being carried out. However, the strip should be flush with and at the same crossfall as the adjacent travelled lane.

With expressways and 4-lane arterials, a 600 mm (2 ft) surface treated or paved right shoulder strip should be considered. (The Department is intending to construct and monitor such a paved strip on the Trans Canada Highway, Oak Lake Bypass). With 2-lane primary arterials a 900 mm (3 ft) paved strip is recommended if the 20-year AADT is projected to be more than 2000 v/d. In the latter case, this provides an overall paved width of 9.2 m (30.2 ft).

2) Drawing #5

The minimum gravel shoulder width on paved highways is 1.3 m. Stage construction is recommended for collectors where the projected 20-year AADT is in the 300 v/d range; it is also recommended for arterials where the 20-year AADT is less than 300 v/d.

5. **CONCLUSIONS AND RECOMMENDATIONS:** (cont'd)

3) Drawing #6

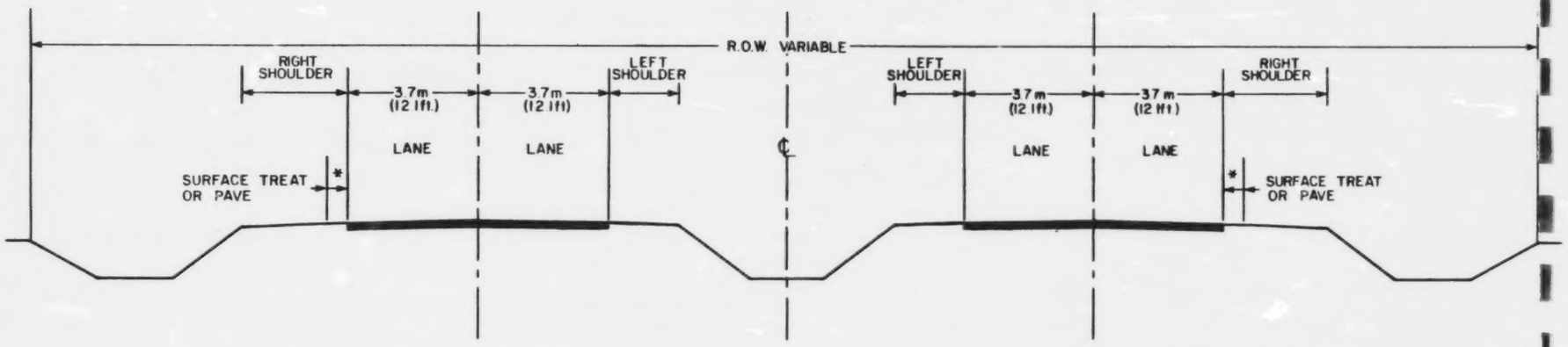
The top width for all gravel roads is proposed to be 8 m (8.4 m in rolling terrain). This standard represents an increase from 7.4 m (the previous minimum width) and a decrease in the other gravel standard which was previously 8.4 m. (Where the road is situated in rolling terrain 8.4 m still applies.) The main reason for raising the standard from 7.4 m to 8 m is for added safety; also few gravel roads were actually being built to 7.4 m width. The reduction in width from 8.4 m to 8 m should result in some economies in both construction and maintenance and is generally considered wide enough for light traffic and farm vehicles.

It is also recommended that for pavement design, all expressways and arterials be designed and constructed to withstand a design axle load of 9100 kg (20 000 lbs) and other highways be designed and constructed to carry axle loads of 8200 kg (18 000 lbs). It is recognized that this may pose financial difficulty, but if adaquate transportation needs are to be catered for, this pavement standard should be considered a long-term goal to be achieved with staged upgrading in accordance with classification and traffic volume needs.

With increasing difficulty in financing roads to be paved, it is also recommended that **warrants to pave roads be raised by about 20% to 300 v/d (20 yr. AADT)** from the existing warrant of 250 v/d (20 yr. AADT). Justification for pavement at traffic volumes less than 300 v/d may be warranted due to special circumstances such as soil conditions, adjacent development, large volumes of truck traffic or the need to maintain the continuity of a surfaced route. It is expected that 800 km (approximate) of roads will remain gravel by raising the paving standards from 250 to 300 v/d (20-year projection). As previously mentioned it is also recommended that roads be constructed in stages according to Drawing No. 5 where it is anticipated that they may not be paved for a 5 to 10 year period but do warrant surfacing. With **stage construction - earth**, the ditches and subgrade are built to accommodate eventual surfacing. However, the travelled roadway is built with gravel to only an 8 m width. Temporary 6:1 slopes (grassed) are provided at the top of the subgrade to transition from the 8 m gravel top to the normal 4:1 side slopes rising from the ditches. With **stage construction - rock**, the ditches should be constructed at the final location so the subgrade can be widened later to accommodate surfacing in a manner that will not affect the ditches. It is assumed in this latter case that the rock for widening will be provided from borrow areas beyond the ditches. Provision of the 8 m gravel top in both types of stage construction (as compared with something wider) should result in considerable savings in maintenance costs prior to the highway being hard surfaced.

(20)

4-LANE DIVIDED (20YR. AADT > 5000)

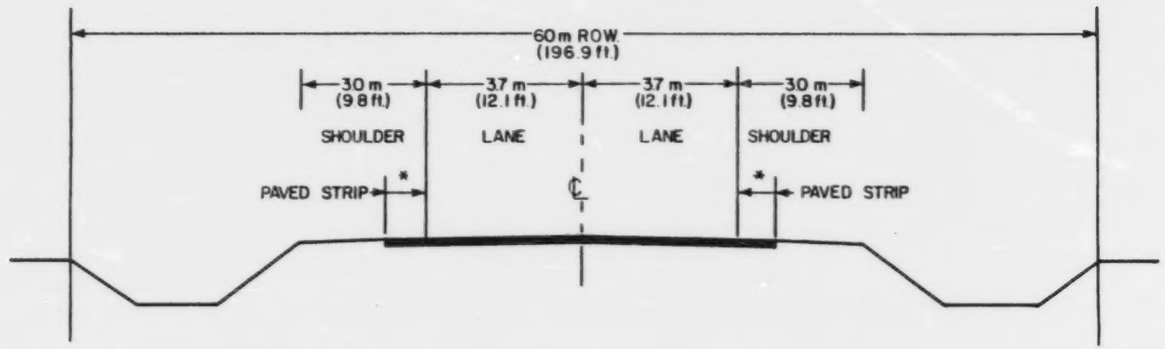


	LEFT SHOULDER	RIGHT SHOULDER
EXPRESSWAY	2.0 m (6.6 ft.)	3.0 m (9.8 ft.*)
ARTERIAL	1.5 m (4.9 ft.)	3.0 m (9.8 ft.*)
COLLECTOR	1.0 m (3.3 ft.)	2.0 m (6.6 ft.)

*SURFACE TREAT OR PAVE INSIDE 0.6m (2.0 ft.)

DWG. Nº. 1
MARCH 1986

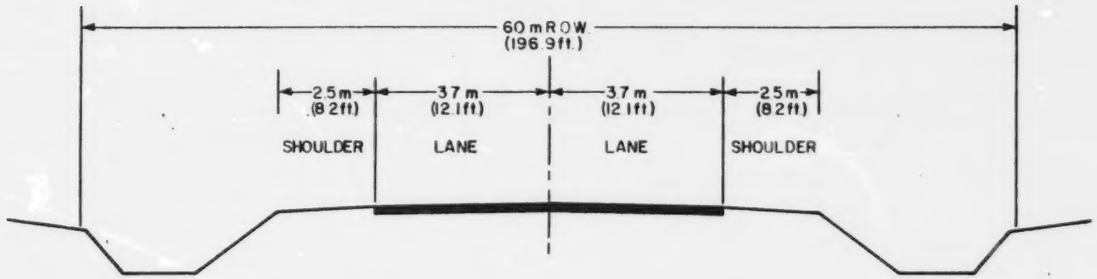
PRIMARY ARTERIAL (20YR. AADT > 1000)



*NOTE: FOR 20YR. AADT > 2000, PAVE INSIDE 0.9 m (3ft.)

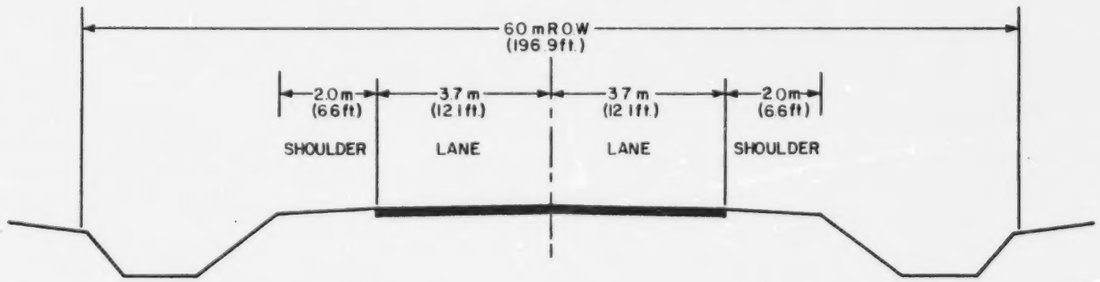
DWG. Nº 2
MARCH 1980

PRIMARY ARTERIAL (20YR. AADT < 1000)
SECONDARY ARTERIAL (20YR. AADT > 1000)



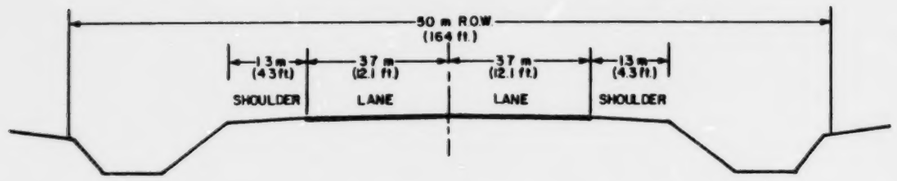
DWG. Nº 3
MARCH 1986

SECONDARY ARTERIAL (20YR. AADT < 1000)
COLLECTOR (20YR. AADT > 1000)

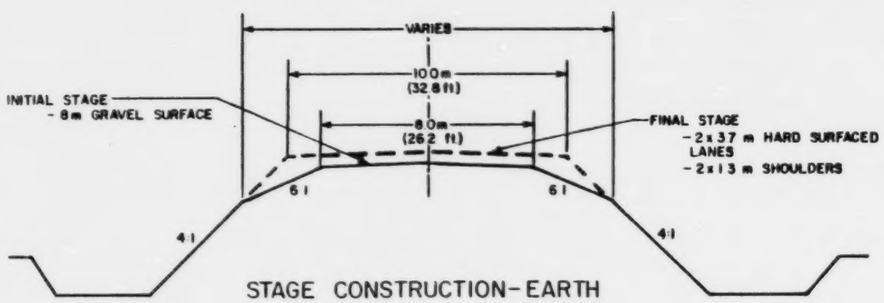


DWG. Nº 4
MARCH 1986

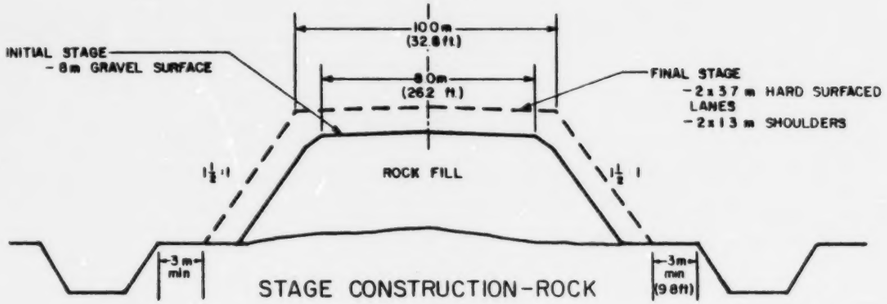
SECONDARY ARTERIAL (20YR. AADT 300 TO 500)
COLLECTOR (20YR. AADT 300 TO 1000)



SECONDARY ARTERIAL (20YR. AADT < 300)
COLLECTOR (20YR. AADT IN 300 RANGE)



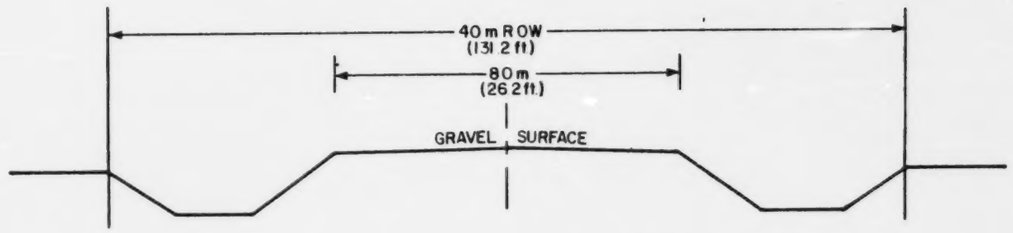
STAGE CONSTRUCTION-EARTH



STAGE CONSTRUCTION-ROCK

DWG. Nº 5
MARCH 1986

COLLECTOR (20 YR. AADT < 300)



NOTE: FOR ROLLING TERRAIN TOP WIDTH TO BE 8.4m & R.O.W. TO BE 45m

DWG. Nº. 6

5. **CONCLUSIONS AND RECOMMENDATIONS:** (cont'd)

The proposed Basic Design Standards for Provincial Highways (Table 1) have incorporated design speeds as previously adopted in the Interim Basic Design Standards (Metric) for the upper classes of road. These speeds are justified as there have been recent increases in speed limits from 90 km/h to 100 km/h on some arterial routes. Also it is noted that actual travel speeds on 2-lane highways are close to 100 km/h in southern Manitoba and close to 110 km/h in remote areas. Actual running speeds on 4-lane divided highways (with depressed median) are close to 110 km/h. For low volume collector highways the design speed range is proposed from 100 km/h (flat terrain), to 90 km/h (rolling terrain) to 80 km/h (rugged terrain) in order to reduce the environmental impact (e.g. to minimize land fragmentation at curves). It is generally recommended that unless the construction costs and environmental impacts are great, highways be designed for the upper design speed in each range. It should be kept in mind that once the highway is constructed, the design speed is a permanent feature which cannot be altered without extensive reconstruction.

The right-of-way widths on Table 1 have been reduced for low volume low classification highways and remain similar to current standards elsewhere. These right-of-way widths apply to the normal type of highway construction using side borrow. Where the sources of subgrade material are from borrow beyond the right-of-way, consideration should be given to reducing these widths, in particular where the highway is crossing prime agricultural land. In the case of multi-lane divided highways, acquisition of right-of-way can be reduced by using median widths in the lower end of the range (but not compromising the safety), and by making use of borrow pits. These alternatives should be given serious consideration where prime agricultural land is affected.

Exhibit B shows the Design Cross-section Map for the Province giving the desired cross-section of each highway required within the 20-year planning period. This map, while representing the basic road cross-section, should be used with considerable care, taking into account such items as terrain, drainage, local developments, soil conditions, and the need to balance excavation and haul for the most economical cross-section. This exhibit along with Exhibit A should be reviewed every 5 years.

5. **CONCLUSIONS AND RECOMMENDATIONS:** (cont'd)

(iii) **Access Control:**

Access control linked to functional classification enables the Department to plan major roadways with little interference from adjacent properties and communities. The access control is exercised to preserve the traffic carrying capacity of the highway, the safety of the highway user and also to preserve the public investment. The controls are effected by acquiring right of access from adjacent private landowners by legislation; by selectively limiting the number of approaches on highways; by requiring specific design criteria be met for access points; by limiting the use of the approach to a particular type of vehicle; by limiting the use of driveways to a specific type of land use; or by any combination of the foregoing.

It is recommended that access be limited on routes that have been identified in Exhibit A falling under expressway or arterial classification. These limited access highways should be under the jurisdiction of the Highway Traffic Board.

The safety aspect of access control can be seen from Figures 4, 5 and 6. Where the access controls are enforced, the accident rates are substantially less. To achieve the maximum service life of the road facility, access spacing is recommended as shown on **Table 2.** The **desirable spacings** as recommended on **Table 2** should be adopted and only under exceptional geometric constraints, most unusual development situations or very difficult ground conditions should consideration be given to reducing the spacing of accesses. The desirable and minimum spacings for farm access shown in Table 2 are based on consideration of a number of factors including current practice, the patterns of land tenure in the Province, and operating speeds on the various classes of highway. **It can be seen that where the primary function of a highway is to service land (Collectors Type B and Type C), the access control is more relaxed.** In this latter case the spacing of accesses should be based on good engineering judgment taking into account factors such as existing and proposed development, terrain and visibility. **It is also recommended that a study of control lines and control circles be done so as to establish the correct limits of controls on each highway appropriate to the recommended functional classification. It may be possible to downsize a considerable number of control circles where future interchanges are unlikely or where development has already occurred to an extent that setback and frontage controls cannot be fully applied. This study is needed immediately.**

CHARACTERISTICS OF RURAL HIGHWAYS — TABLE 2

	COLLECTORS		ARTERIALS		EXPRESSWAYS	
	TYPES "B & C"	TYPE "A"	SECONDARY	PRIMARY	STAGE 1	STAGE 2 (Freeway)
Traffic Service	Traffic movement secondary function	Traffic movement and	Traffic movement primary function	Optimum mobility	Optimum mobility	Optimum mobility
Land service	Land access primary function	land access both of equal importance	Land access secondary consideration		Access to selected municipal roads	No access
Characteristic of traffic flow	Interrupted flow	Interrupted flow	Uninterrupted flows except at traffic signals		Uninterrupted flow except at traffic signals	Free flow
Connects major centres of population	less than 500	500 - 1 000	1 000 - 10 000	Over 10 000	Over 10 000	
Assumed average running speed (km/h)	50 - 80	60 - 90	70 - 90	80 - 110	90 - 110	
Vehicle type	Mostly cars, light to medium trucks, occasional heavy trucks	Mostly cars with all types of trucks	All types of vehicles up to 15% trucks	All types with up to 20% trucks	All types with up to 30% trucks	
Connects to	Expressways arterials collectors and locals	All classes	All classes	All classes	All classses	All classes except locals
Minimum spacing of farm accesses		80 - 300 m	300 m	400 m	No direct approach	No approach
Desirable spacing of farm accesses		200 - 600 m	600 m	800 m		
Traffic entering & leaving access — Under 50 ADT		Direct access	Direct access		No direct access, access via service road	
50 to 500 ADT		Direct access	Service road/turn lanes			
Over 500 ADT		Direct access/ turn lanes	Service road/turn lanes			

5. **CONCLUSIONS AND RECOMMENDATIONS:** (cont'd)

In general, it is recommended that where direct access is required, the following should be considered:

(a) function of the access and function of the highway
(b) existing and recommended spacings of accesses on the highway
(c) property use
(d) types and numbers of vehicles using the highway
(e) types and numbers of vehicles using the access; also directional split
(f) estimated speed of vehicles entering and leaving the access
(g) stopping and passing sight distances
(h) sight triangles
(i) profile, cross-section, width of road and driveway
(j) drainage and other constraints

Figure 7 shows the various control systems currently in place for development and access control in Manitoba along with the proposed functional classification. With the implementation of the functional classification and associated access controls, it is noted that there will be similar access control as existing in the upper class of highways (40%). In the lower class (60%), access and development control can be more relaxed.

RURAL HIGHWAY CLASSIFICATION

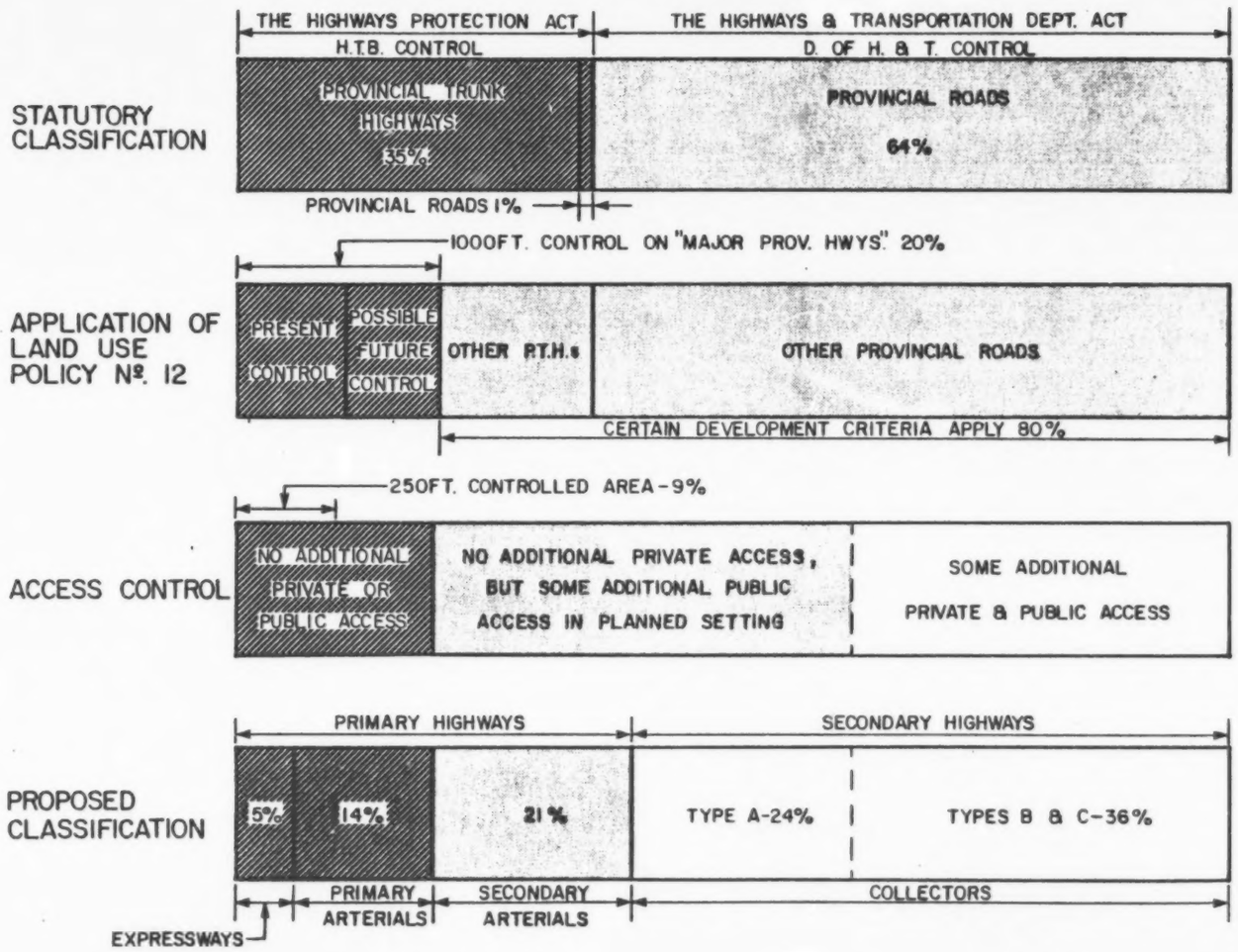


FIGURE 7

SCHEDULE 1
DEFINITIONS

PROPOSED HIGHWAY FUNCTIONAL CLASSES

RURAL EXPRESSWAYS: These are generally multi-lane, divided highways (or highways that will be multi-laned in the next 20 years) that carry large traffic volumes at high speed under close to free flow conditions. They connect (and sometimes bypass) cities and larger towns and serve industrial, recreational, international and interprovincial traffic. In order to maintain the flow and safety of through traffic, direct property access is normally eliminated. Important cross roads may require grade separated interchanges.
(Freeway is an expressway with all cross roads and railway crossings grade separated).

RURAL ARTERIALS: These are generally two-lane or in some cases multi-lane highways that carry large traffic volumes at high speeds. In conjunction with expressways, they connect major economic regions and centres of the Province such as cities and towns, industrial concentrations, agricultural areas and major recreational facilities. In order to maintain the flow and safety of through traffic, direct access to abutting land may be restricted or eliminated. This applies particularly in undeveloped areas where lack of other road service may encourage strip development.

RURAL COLLECTORS: These collect traffic from local roads and feed it to arterials, or distribute it from arterials to locals. They provide direct service for developments such as tourist attractions, mines, small towns and villages. They serve equally, the function of movement and land access.

NOTE: Resource roads may be classified under the collector classification.

SCHEDULE 2

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SCHEDULE 2 (cont'd)

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PROVINCE OF MANITOBA

HIGHWAY FUNCTIONAL CLASSIFICATION MAP

20 YEAR PROJECTION

(MARCH , 1986)

KEY :

EXPRESSWAY _____

PRIMARY ARTERIAL _____

SECONDARY ARTERIAL _____

COLLECTORS ____ A _____

____ B _____

____ C _____

LOCALS _____

POPULATION CENTRES > 10,000 _____ ★

POPULATION CENTRES > 5,000 < 10,000 _____ ✪

POPULATION CENTRES > 1,000 < 5,000 _____ ☆

POPULATION CENTRES > 500 < 1,000 _____ ●

POPULATION CENTRES > 50 < 500 _____ ○

VISITORS / YEAR

RECREATIONAL AREAS > 30,000 _____ ▲

RECREATIONAL AREAS > 15,000 < 30,000 _____ △

RECREATIONAL AREAS > 8,000 < 15,000 _____ ▲

RECREATIONAL AREAS > 2,000 < 8,000 _____ ▲

LEGEND

PROVINCIAL TRUNK HIGHWAYS 83

PROVINCIAL ROADS 615

DISTRICT BOUNDARIES .....

MUNICIPAL BOUNDARIES .....

SCALE IN MILES

5 0 5 10 15 20

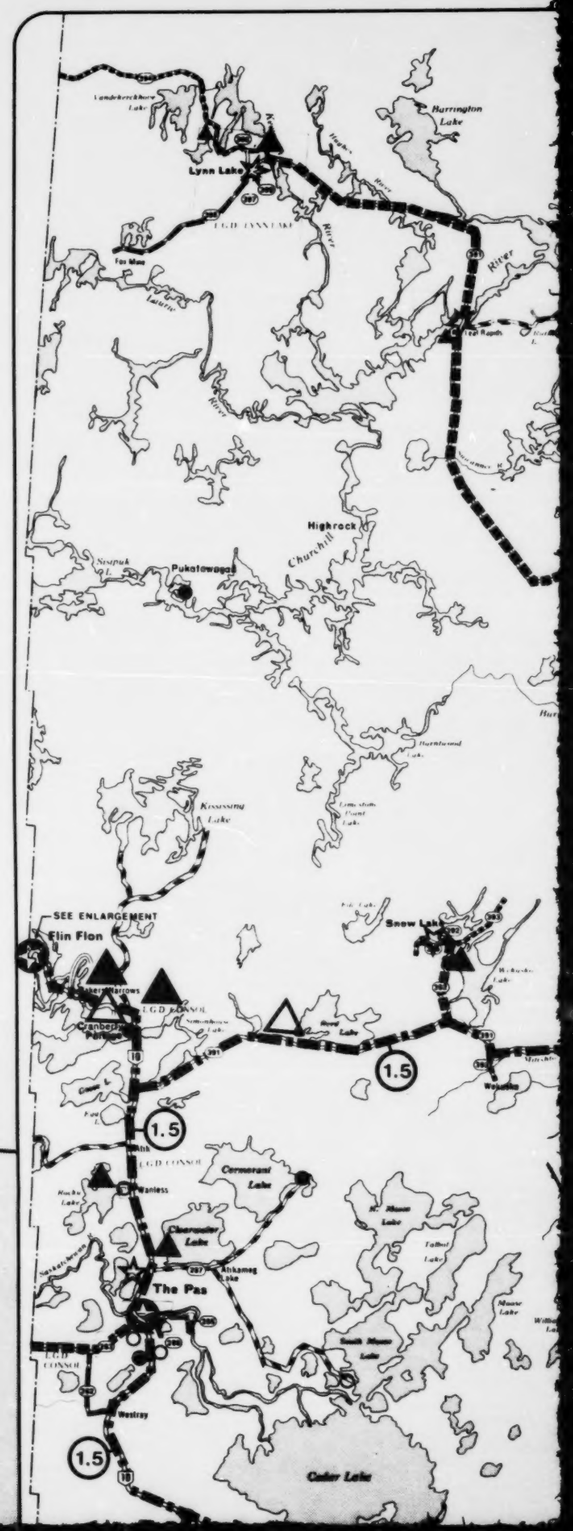
SCALE IN KILOMETRES

8 0 8 16 24 32

PROVINCE OF MANITOBA
DEPARTMENT OF HIGHWAYS
AND TRANSPORTATION
DESIGN OFFICE
WINNIPEG

APRIL 1984

REVISED : APRIL , 1985
AUGUST, 1985
DECEMBER, 1985



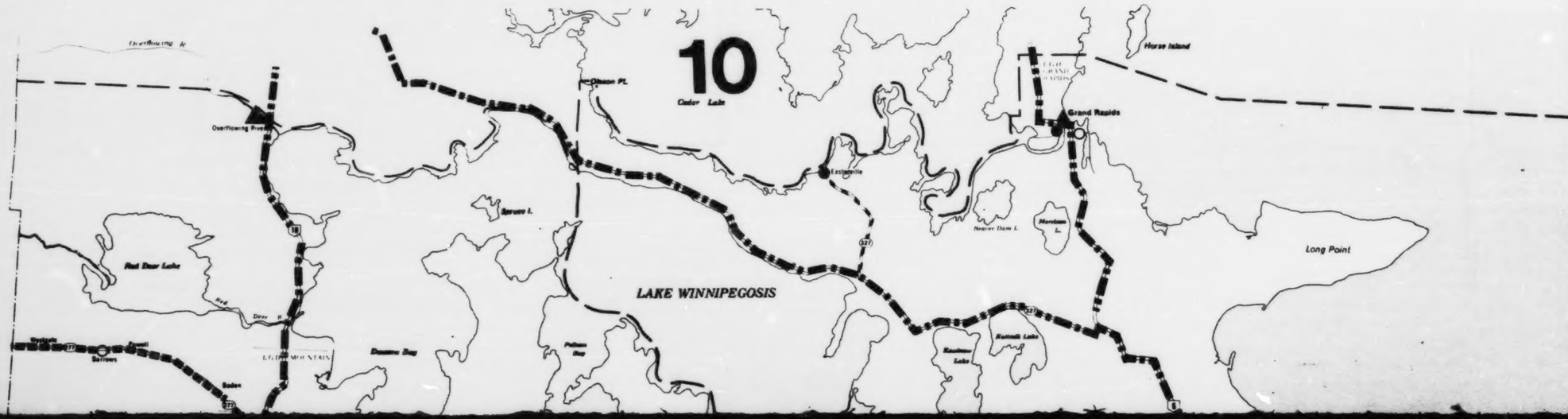


Exhibit A

PROVINCE OF MANITOBA

HIGHWAY FUNCTIONAL CLASSIFICATION MAP

20 YEAR PROJECTION

(MARCH , 1986)

LEGEND

PROVINCIAL TRUNK HIGHWAYS ..... (83)

PROVINCIAL ROADS ..... (416)

DISTRICT BOUNDARIES .....

MUNICIPAL BOUNDARIES .....

SCALE IN MILES

5 0 5 10 15 20

SCALE IN KILOMETRES

8 0 8 16 24 32

PROVINCE OF MANITOBA
DEPARTMENT OF HIGHWAYS
AND TRANSPORTATION
DESIGN OFFICE
WINNIPEG

APRIL 1986

REVISED : APRIL , 1985
AUGUST, 1985
DECEMBER, 1985

PROVINCIAL HIGHWAYS FUNCTIONAL CLASSIFICATION MAP

Lynn Lake
Fox Lake
Barrington Lake
Southern Indian Lake
Gauer Lake
Leaf Rapids
Highrock
Churchill River
Nelson House
Thompson
Gillam
Split Lake
Nelson River
Pukatawagan
Sisipuk Lake
Kississing Lake
SEE ENLARGEMENT
Flin Flon
Snow Lake
Cranberry Portage
Wanless
Cormorant Lake
Clearwater Lake
Wekusko Lake
The Pas
Westray
Cedar Lake
Wabowden
Setting Lake
Sipiwesk Lake
Opaskwayak
Cross Lake
Oxford Lake
Knee Lake
Gods Lake
Moose Lake
Norway House
Grand Rapids
Horse Island
Long Point
Moose Lake
Reindeer Lake

REDUCTION OF DISTRICT 10

SCALE IN MILES

10 0 10 20 30 40

10

9

LAKE WINNIPEGOSIS

LAKE WINNIPEG

Cedar Lake

Overflowing R.

Overflowing River

Grand Rapids

Easterville

Horse Island

Long Point

Spruce I.

Red Deer Lake

Red Deer R.

Dunnes Bay

Birch River

Lenswood

Bowsman

PROPOSED RELOC.

Swan River

Minitonas

Benito

Durban

Sclater

Duck River

Duck Bay

Campervill

Showman

Waterhen

Waterhen Lake

Pine River

Pulp River

Garland

Gypsumville

St. Martin

Lake St. Martin

Fairford

Reindeer Island

Steeprock Bay

Anama Bay

Flin Flon

Cormorant Lake

The Pas

Westray

Wanless

Overflowing River

Lake Winnipegosis

Birch Island

Swan River

Pelican Lake

Swan Lake

Red Deer R.

Meadow Lake

Meadow Portage

Batrows

Baden

Maleking

Bellsite

Nora

Armet L.

Woodwards Lakes

Rau L.

Child L.

Baggy Creek

Wellman

Sclater River

Swan River

Waterhen R.

Pelican R.

Overflowing R.

Pickerel L.

Steeprock L.

Island Lake

Waterhen Lake

Meadow Lake

Meadow L.

Henry Dam L.

Pelican Lake

Cormorant Lake

Clearwater Lake

Wekusko Lake

Hanson Lake

Moose Lake

Westray

Cedar Lake

Overflowing River

Lake Winnipegosis

Hut Dam L.

Cranberry Portage

Wanless

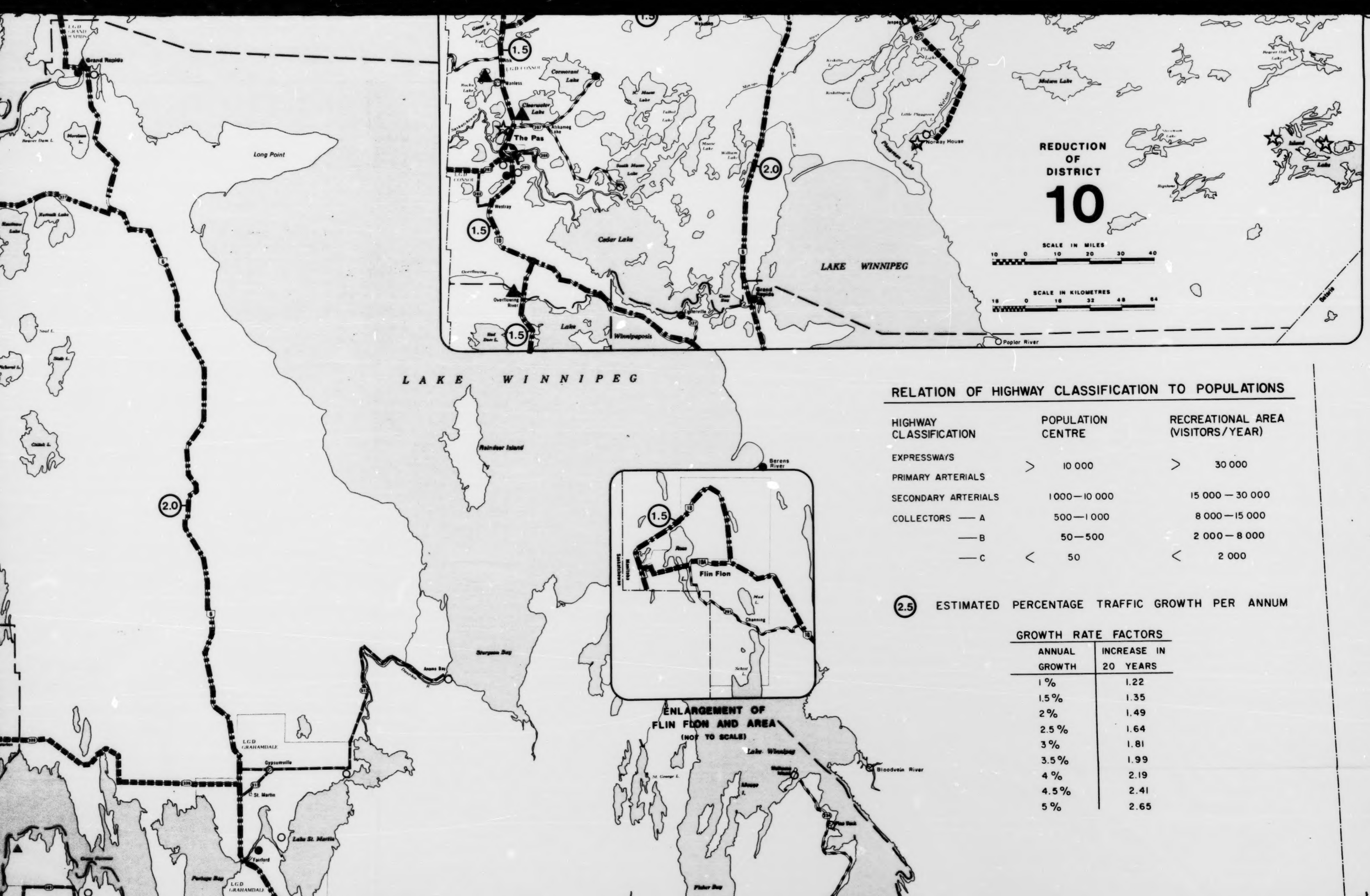
The Pas

Flin Flon

ENLARGEMENT
FLIN FLON AND
(NOT TO SCA

1.5

2.0



RELATION OF HIGHWAY CLASSIFICATION TO POPULATIONS

HIGHWAY CLASSIFICATION	POPULATION CENTRE	RECREATIONAL AREA (VISITORS/YEAR)
EXPRESSWAYS PRIMARY ARTERIALS	> 10 000	> 30 000
SECONDARY ARTERIALS	1000—10 000	15 000 — 30 000
COLLECTORS — A	500—1 000	8 000—15 000
— B	50—500	2 000 — 8 000
— C	< 50	< 2 000

(2.5) ESTIMATED PERCENTAGE TRAFFIC GROWTH PER ANNUM

GROWTH RATE FACTORS

ANNUAL GROWTH	INCREASE IN 20 YEARS
1 %	1.22
1.5 %	1.35
2 %	1.49
2.5 %	1.64
3 %	1.81
3.5 %	1.99
4 %	2.19
4.5 %	2.41
5 %	2.65

8

11

7

6

PROPOSED RELOCATION

OLD ROUTE IS A PRIMARY ARTERIAL UNTIL NEW ROUTE IS BUILT.

PROPOSED RELOCATION

PROPOSED RELOCATION

PROPOSED RELOCATION

PROPOSED RELOCATION

PROPOSED RELOCATION

PROP. RELOC.

PROP. RELOC.

PROPOSED RELOCATION

PROPOSED RELOC.

FUTURE ROUTE

LAKE MANITOBA

LAKE MANITOBA

DAUPHIN LAKE

ENLARGEMEN
FLIN FLON AND
(NOT TO SCA

1.5

2.0

2.5

3.0

3.5

Pine River
Duck River
Pulp River
Garland
Etholbert
Fork River
Minitonas R.
Swan R.
Valley River
Valley River
Shortdale
Timberton
Grandview
Gilbert Plains
Dauphin
Ochre River
Ste Rose du Lac
Ste Amelie
Laurier
Makinak
Inglis
Russell
Silverton
Roseburn
Binscarth
Oakburn
Elphinstone
Sandy Lake
Rackham
Erickson
Strathclair
Newdale
Bethany
Basswood
Franklin
Moosepawa
McCreary
Kelwood
Norgate
Glencarn
Clanwilliam
Polonia
Eden
Birnie
Glenella
Riding Mountain
Mountain Road
Tenby
Plumas
Ardoch
Ogilvie
Langruth
Amaranth
Lakeland
Lynch's Point
Gladstone
Woodside
Delta Beach
Portage la Prairie
Crane River
Toutes Aides
Rorketon
Sifton
Crane Mountain
Waterton
Gypsumville
St. Martin
Lake St. Martin
Fairford
Portage Bay
Hilbre
Steep Rock
Grahamdale
Spearhill
Moosehorn
Wishbone Bay
Meadows Bay
Ashern
Eddystone
Vogar
Kinosota
Camper
Day Lake
Hodgson
Fisher Branch
Broad Valley
Zbaraz
Arborg
Erikadale
Poplarfield
Deerhorn
Chatfield
Lundar
Clarkleigh
Oak Point
St. Laurent
Lake Francis
St. Ambroise
Woodlands
Argyle
Warren
Balmoral
Meleb
Fraserwood
Koostatak
Dallas
Fisher Bay
Lake Winnipegosis
Lake Manitoba
Lake of the Prairies
Shell River
Assiniboine River
Little Saskatchewan River
Whitemud River
Waterhen River
Fishing River
Ukraina
Swan River
Whirlpool River
Meleb
Arborg
Ste. Rose du Lac
Shellmouth
Mt. Auley
Brutah
Minnota
Hamiota
Cardale
McConnell
Harrowby
Millwood
Binscarth
Rossburn
Oakburn
Elphinstone
Sandy Lake
Rackham
Erickson
Strathclair
Newdale
Basswood
Franklin
Moosepawa
Ardoch
Ogilvie
Langruth
Amaranth
Lakeland
Lynch's Point
Gladstone
Woodside
Delta Beach
Portage la Prairie
Crane River
Toutes Aides
Rorketon
Sifton
Crane Mountain
Waterton
Gypsumville
St. Martin
Lake St. Martin
Fairford
Portage Bay
Hilbre
Steep Rock
Grahamdale
Spearhill
Moosehorn
Wishbone Bay
Meadows Bay
Ashern
Eddystone
Vogar
Kinosota
Camper
Day Lake
Hodgson
Fisher Branch
Broad Valley
Zbaraz
Arborg
Erikadale
Poplarfield
Deerhorn
Chatfield
Lundar
Clarkleigh
Oak Point
St. Laurent
Lake Francis
St. Ambroise
Woodlands
Argyle
Warren
Balmoral
Meleb
Fraserwood
Koostatak
Dallas
Fisher Bay
Lake Winnipegosis
Lake Manitoba
Lake of the Prairies
Shell River
Assiniboine River
Little Saskatchewan River
Whitemud River
Waterhen River
Fishing River
Ukraina
Swan River
Whirlpool River
Meleb
Arborg
Ste. Rose du Lac
Shellmouth
Mt. Auley
Brutah
Minnota
Hamiota
Cardale
McConnell
Harrowby
Millwood
Binscarth
Rossburn
Oakburn
Elphinstone
Sandy Lake
Rackham
Erickson
Strathclair
Newdale
Basswood
Franklin
Moosepawa
Ardoch
Ogilvie
Langruth
Amaranth
Lakeland
Lynch's Point
Gladstone
Woodside
Delta Beach
Portage la Prairie
Crane River
Toutes Aides
Rorketon
Sifton
Crane Mountain
Waterton
Gypsumville
St. Martin
Lake St. Martin
Fairford
Portage Bay
Hilbre
Steep Rock
Grahamdale
Spearhill
Moosehorn
Wishbone Bay
Meadows Bay
Ashern
Eddystone
Vogar
Kinosota
Camper
Day Lake
Hodgson
Fisher Branch
Broad Valley
Zbaraz
Arborg
Erikadale
Poplarfield
Deerhorn
Chatfield
Lundar
Clarkleigh
Oak Point
St. Laurent
Lake Francis
St. Ambroise
Woodlands
Argyle
Warren
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Meleb
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Fishing River
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Swan River
Whirlpool River
Meleb
Arborg
Ste. Rose du Lac
Shellmouth
Mt. Auley
Brutah
Minnota
Hamiota
Cardale
McConnell
Harrowby
Millwood
Binscarth
Rossburn
Oakburn
Elphinstone
Sandy Lake
Rackham
Erickson
Strathclair
Newdale
Basswood
Franklin
Moosepawa
Ardoch
Ogilvie
Langruth
Amaranth
Lakeland
Lynch's Point
Gladstone
Woodside
Delta Beach
Portage la Prairie

1.5%	1.35
2%	1.49
2.5%	1.64
3%	1.81
3.5%	1.99
4%	2.19
4.5%	2.41
5%	2.65

ENLARGEMENT OF FLIN FLON AND AREA (NOT TO SCALE)

OLD ROUTE IS A PRIMARY ARTERIAL UNTIL NEW ROUTE IS BUILT.

PROPOSED RELOCATION

PROPOSED RELOCATION

PROPOSED RELOCATION

PROPOSED RELOCATION

PROPOSED RELOCATION

FUTURE ROUTE

FUTURE ROUTE

FUTURE ROUTE

FUTURE ROUTE

LAKE MANITOBA

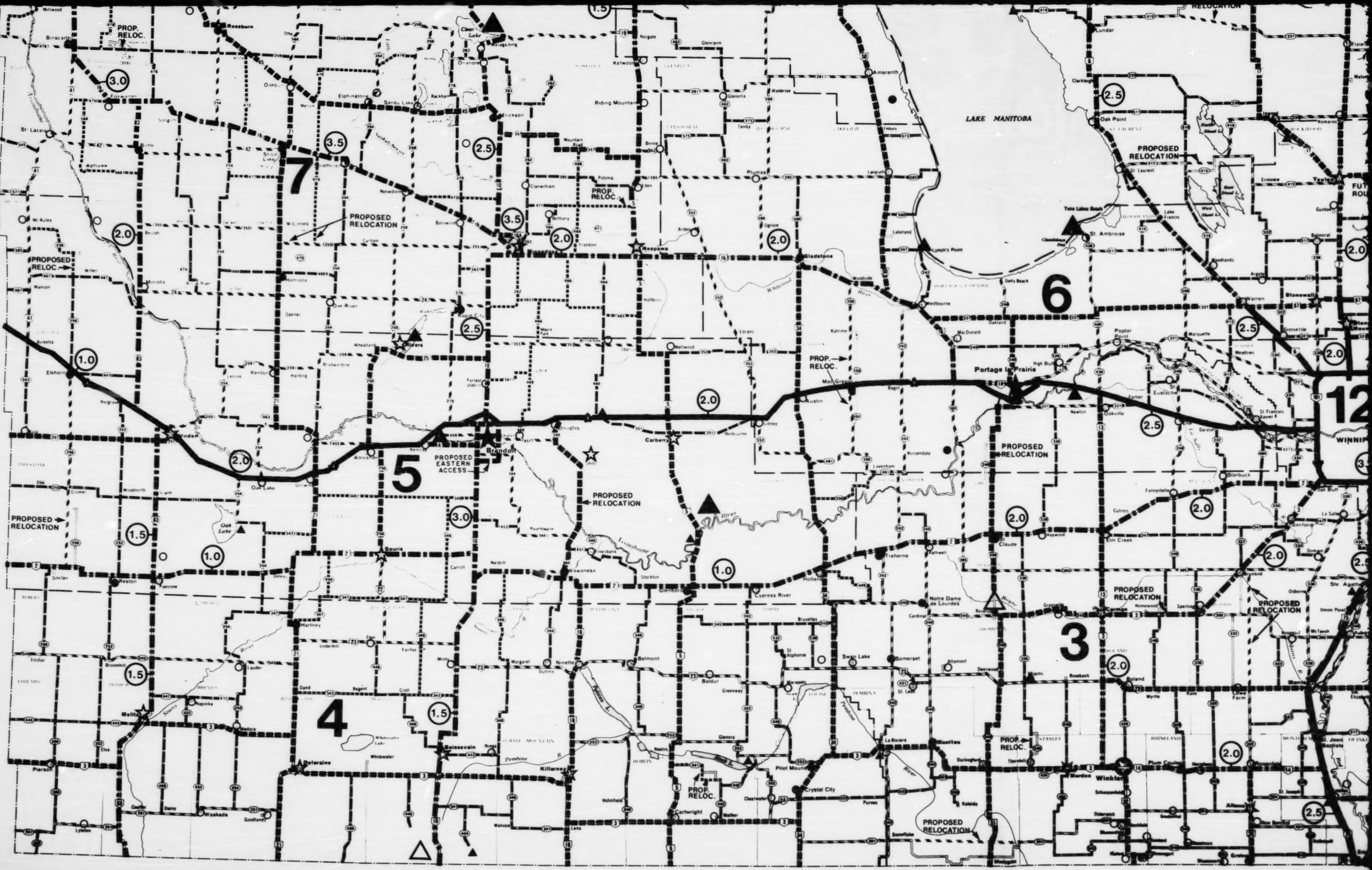
LAKE MANITOBA

LAKE WINNIPEG

11

6

1


PROP. RELOC.
PROPOSED RELOCATION
PROPOSED RELOC.
PROPOSED EASTERN ACCESS
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PROP. RELOC.
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PROPOSED RELOCATION
PROPOSED RELOCATION
PROP. RELOC.
PROP. RELOC.
PROPOSED RELOCATION
PROPOSED RELOCATION
LAKE MANITOBA
7
6
5
4
3
12
Brandon
Portage la Prairie
Gladstone
Carberry
Killarney
Souris
Melita
Boissevain
Deloraine
Crystal City
Pilot Mound
Winkler
Morden
Carman
Treherne
Holland
Cypress River
Glenboro
Stockton
Rivers
Minnedosa
Oak River
Hamiota
Neepawa
Minnedosa
Erickson
Riding Mountain
Elphinstone
Sandy Lake
Oakburn
Rossburn
Binscarth
Foxwarren
Millwood
St. Lazare
Birtle
Waywayseecappo
Russell
Roblin
Shoal Lake
Oak Lake
Elkhorn
Virden
Hargrave
Kenton
Harding
Wheatland
Edrans
Wellwood
Douglas
Alexander
Rounthwaite
Newdale
Bethany
Franklin
Aden
Plumas
Lavenham
Rossendale
Amaranth
Glenella
Kelwood
Norgate
Glencarn
Oak Point
Lundar
Narcisse
Clarkleigh
Lake Francis
St. Ambrose
Lynch's Point
Lakeland
Delta Beach
Westbourne
Woodside
Oakland
MacDonald
Poplar Point
Marquette
Meadows
Rosser
St. Eustache
Oakville
Newton
Starbuck
Fannystelle
Elm Creek
Claude
Haywood
Mathwell
Notre Dame de Lourdes
Cardinal
Homewood
Sperling
Roseisle
Osborne
Ste. Agathe
Union Point
McTavish
Rosenort
Myrtle
Rosebank
Roland
Altamont
Somerset
St. Lazare
Swan Lake
St. Alphonse
Brookdale
Belmont
Baldur
Greenway
Ninette
Margaret
Darnia
Glenora
Kelsin
Whitewater Lake
Whitewater
Pierson
Lyleton
Goodlands
Waskada
Reston
Tilston
Broomhill
Sinclair
Wawanesa
Rounthwaite
Newbank
Mather
Cartwright
Holmfield
Lena
Purves
Sourisford
Kaleida
Darlingford
Thornhill
Stanley
Rhineland
Plum Coulee
Gretna
Altona
Emerson
Letellier
Dominion City
Starbuck
Ste. Agathe
Landmark
Lorette
Ile des Chenes
Otterburne
Niverville
Ste. Anne
Lorette
Elie
Cromer
Woodnorth
Starbuck
Culross
Treherne
Cypress River
Brookdale
Swan Lake
Somerset
Altamont
Roseisle
Rosenort
Ile des Chenes
Otterburne
Niverville
Ste. Anne
Landmark
Lorette
Emerson
Letellier
Dominion City
Gretna
Altona
Plum Coulee
Rhineland
Stanley
Darlingford
Thornhill
Kaleida
Purves
Sourisford
Lena
Waskada
Goodlands
Lyleton
Pierson
Melita
Tilston
Broomhill
Reston
Sinclair
Virden
Elkhorn
Hargrave
Kenton
Harding
Wheatland
Edrans
Wellwood
Douglas
Alexander
Rounthwaite
Newdale
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Franklin
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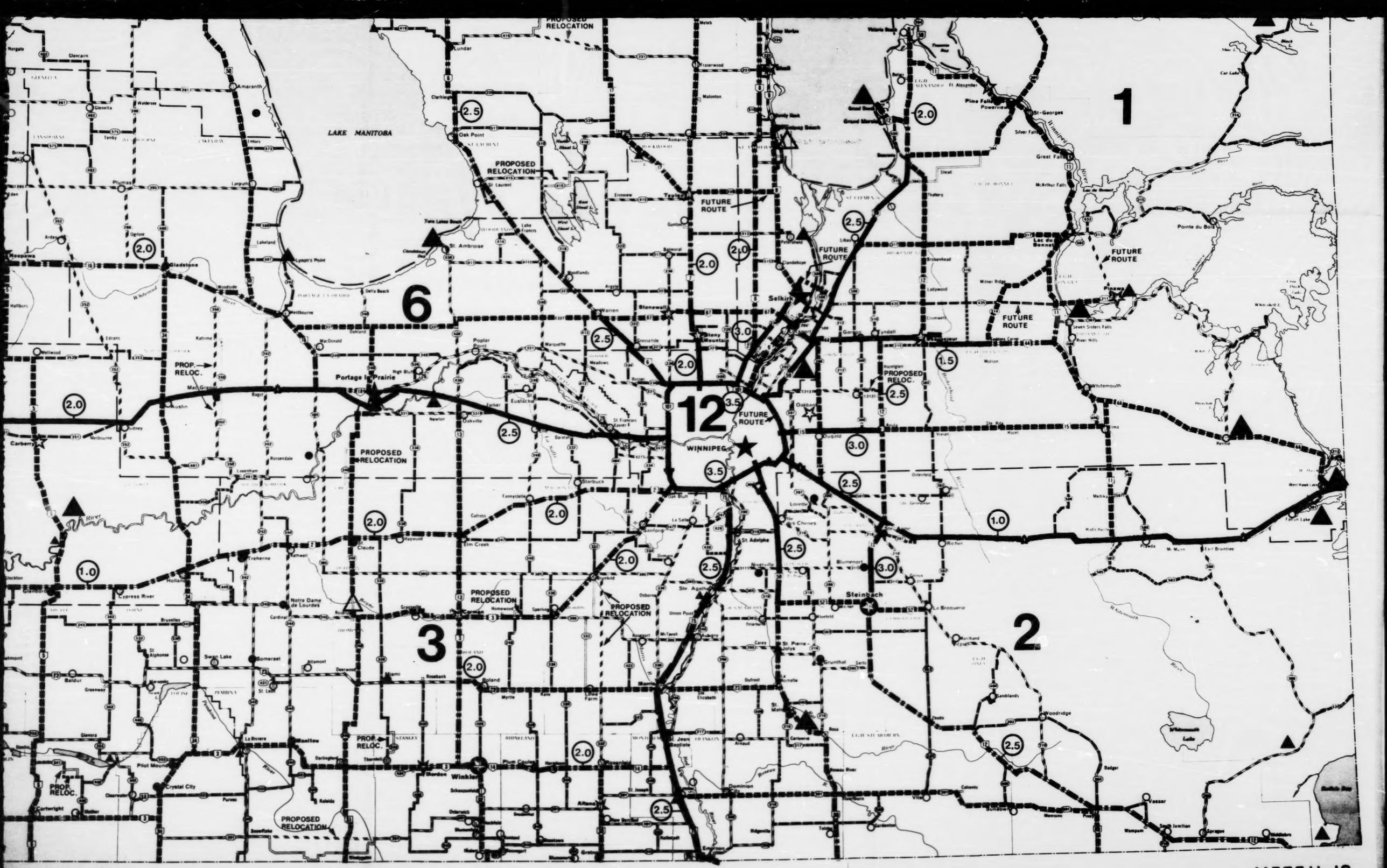
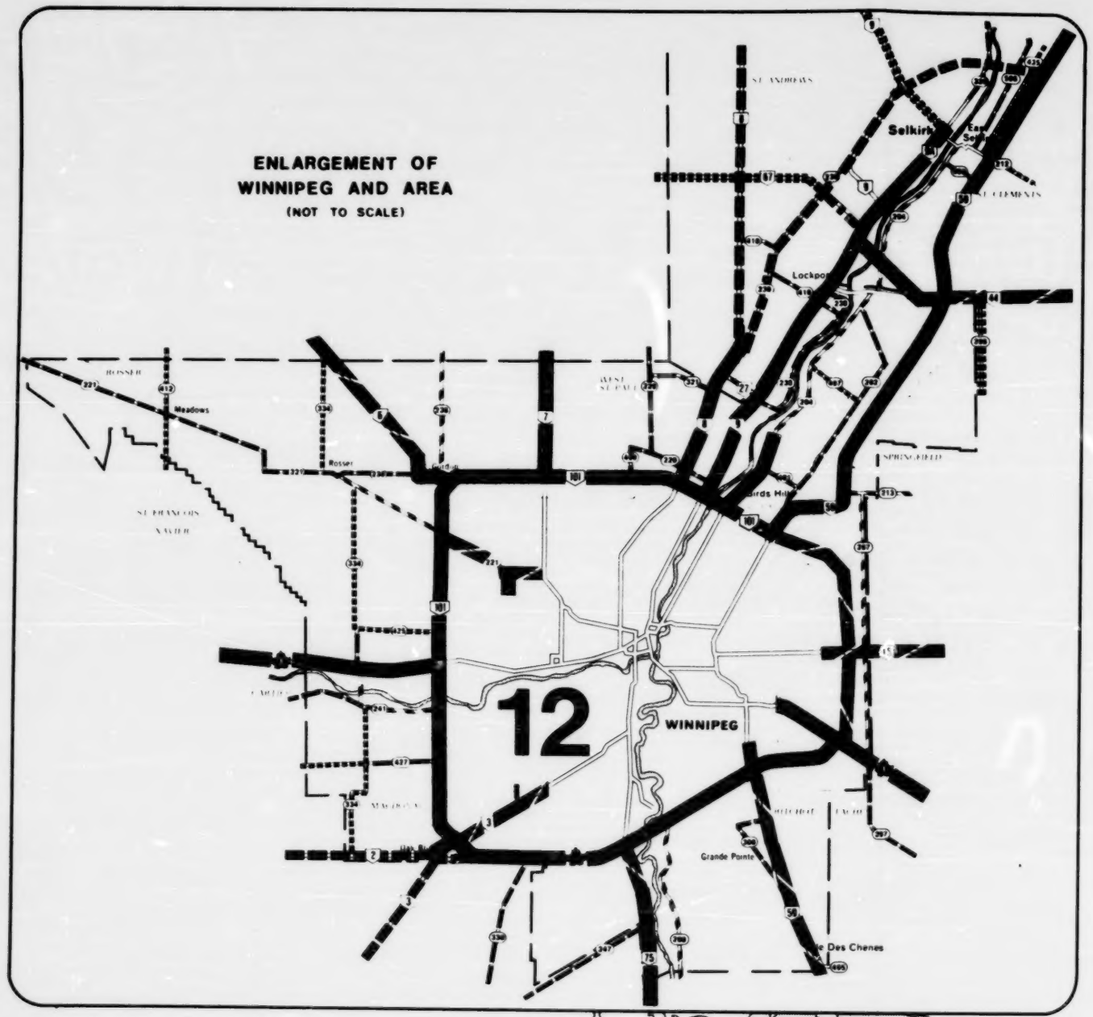
Lavenham
Rossendale
Amaranth
Glenella
Kelwood
Norgate
Glencarn
Oak Point
Lundar
Narcisse
Clarkleigh
Lake Francis
St. Ambrose
Lynch's Point
Lakeland
Delta Beach
Westbourne
Woodside
Oakland
MacDonald
Poplar Point
Marquette
Meadows
Rosser
St. Eustache
Oakville
Newton
Starbuck
Fannystelle
Elm Creek
Claude
Haywood
Mathwell
Notre Dame de Lourdes
Cardinal
Homewood
Sperling
Roseisle
Osborne
Ste. Agathe
Union Point
McTavish
Rosenort
Myrtle
Rosebank
Roland
Altamont
Somerset
St. Lazare
Swan Lake
St. Alphonse
Brookdale
Belmont
Baldur
Greenway
Ninette
Margaret
Darnia
Glenora
Kelsin
Whitewater Lake
Whitewater
Pierson
Lyleton
Goodlands
Waskada
Reston
Tilston
Broomhill


LAKE MANITOBA
PROPOSED RELOCATION
FUTURE ROUTE
PROP. RELOC.
PROPOSED RELOC.
6
12
1
2
3
WINNIPEG
Selkirk
Portage la Prairie
Steinbach
Winkler
Carberry
Gladstone
Amaranth
Plumas
Oak Point
St Laurent
Stonewall
Oakbank
Dugald
Whitemouth
Pine Falls
Powerview
St-Georges
Great Falls
Pointe du Bois
Seven Sisters Falls
Lac du Bonnet
Pinawa
Steinbach
Woodridge
Sandilands
Vassar
Treherne
Cypress River
Pilot Mound
Crystal City
Carman
Morden
Swan Lake
Somerset
Roland
Starbuck
Elm Creek
Ste Agathe
Dominion
Arnaud
Dufrost
Grunthal
Niverville
Blumenort
Richer
Lorette
Ste Anne
Ste Adolphe
Sanford
Headingley
Portage Diversion
Assiniboine River
Red River
Whitemouth River
Winnipeg River
Brokenhead River
Seine River
Rat River
Boyne River
Pembina River
Roseau River
Rock Lake
Whitemouth Lake
Falcon Lake
Rennie
Lac du Bonnet
Pinawa
Molson
Hazelglen
Ladywood
Milner Ridge
Brokenhead
Lyndall
Cromwell
Garson
Meleb
Lundar
Fraserwood
Malonton
Aonamo
Ennoweu
Taylor
Lake Francis
Twin Lakes Beach
St. Ambroise
Lynch's Point
Lakeland
Ogilvie
Ardenton
Woodlands
Warren
Poplar Point
MacDonald
Oakland
Westbourne
Gladstone
Hallboro
Wellwood
Edrans
Austin
Sidney
Melbourne
Bagot
Mac Gregor
Newton
Oakville
St Eustache
St Francis Xavier
Headingley
Starbuck
Fannystelle
Cutross
Elm Creek
Claude
Haywood
Treherne
Holland
Cypress River
Notre Dame de Lourdes
Brussels
St Alphonse
Baldur
Greenway
Glenora
Pilot Mound
Crystal City
Carman
Cartwright
Roseau River
Rosenfeld
Rosenort
Lowenham
Darlingford
Thornhill
Myrtle
Roland
Miami
Rosebank
Deerwood
Altamont
Somerset
Swan Lake
Sperling
Homewood
Osborne
Union Point
Aubigny
Mariboro
Carey
St Pierre-Jolys
Dufrost
Grunthal
Sarto
Elizabeth
Rosa
Carillon
Arnaud
Dominion
Emerson
Letellier
Gretna
Altona
Plum Coulee
Rhineland
Stanley
Thornhill
Darlingford
Winkler
Morden
Schanzenfeld
Osterwick
Reinfeld
Rosenfeld
Rosenort
Lowenham
Sundown
Badger
Vassar
Woodridge
Sandilands
Whitemouth
Whitemouth Lake
Rennie
Falcon Lake
West Hawk Lake
Tolstoi

PROVINCE OF MANITOBA

DESIGN CROSS-SECTION MAP
20 YEAR PROJECTION (MARCH, 1986)



LEGEND

Cross-Section relating to:

Drawing No. 1 (Existing 4-lane)

(Future 4-lane)

Drawing No. 2 (2-lane, 3m shoulder- paved strip)

(2-lane, 3m shoulder- gravel)

Drawing No. 3 (2-lane, 2.5m shoulder)

Drawing No. 4 (2-lane, 2m shoulder)

Drawing No. 5 (2-lane, 1.3m shoulder or gravel, stage construction)

Drawing No. 6 (gravel)

SCALE IN MILES

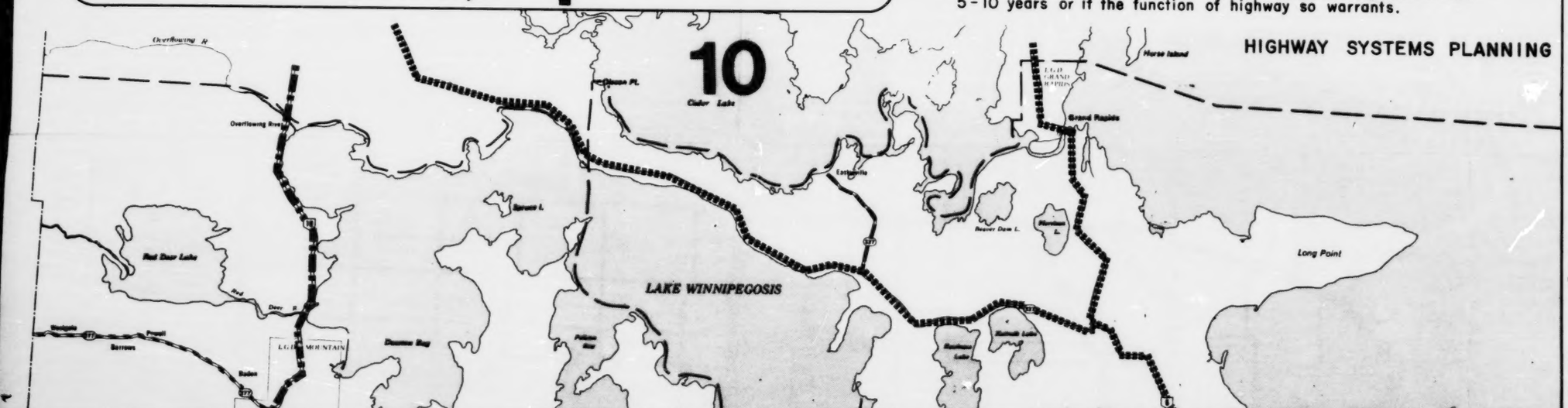
5 0 5 10 15 20

SCALE IN KILOMETRES

8 0 8 16 24 32

NOTES:

1. The map has been based on 1984 traffic volumes and growth rates as predicted in that year.
2. Prior to finalizing design cross-section a review should be made to ensure traffic volumes and development conditions have not changed significantly.
3. This map is to be used in conjunction with Basic Design Standards for Provincial Highways.
4. The cross-sections are for rural highways with no constraints. In the case of development, terrain, soil condition and other constraints further study will be required.
5. Consider stage construction if surface treatment required in next 5-10 years or if the function of highway so warrants.



HIGHWAY SYSTEMS PLANNING

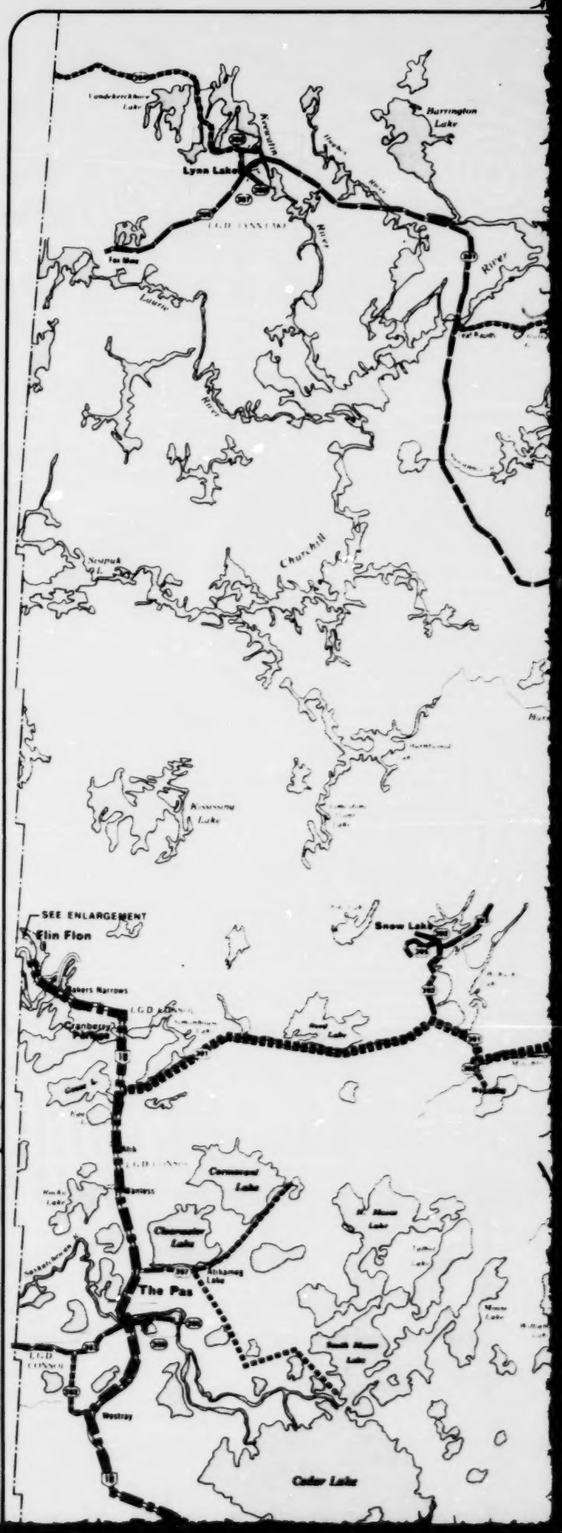


Exhibit B

PROVINCE OF MANITOBA

DESIGN CROSS-SECTION MAP
20 YEAR PROJECTION (MARCH, 1986)

LEGEND

Cross-Section relating to:

- Drawing No. 1 (Existing 4-lane)
- (Future 4-lane)
- Drawing No. 2 (2-lane, 3m shoulder- paved strip)
- (2-lane, 3m shoulder- gravel)
- Drawing No. 3 (2-lane, 2.5m shoulder)
- Drawing No. 4 (2-lane, 2m shoulder)
- Drawing No. 5 (2-lane, 1.3m shoulder or gravel, stage construction)
- Drawing No. 6 (gravel)

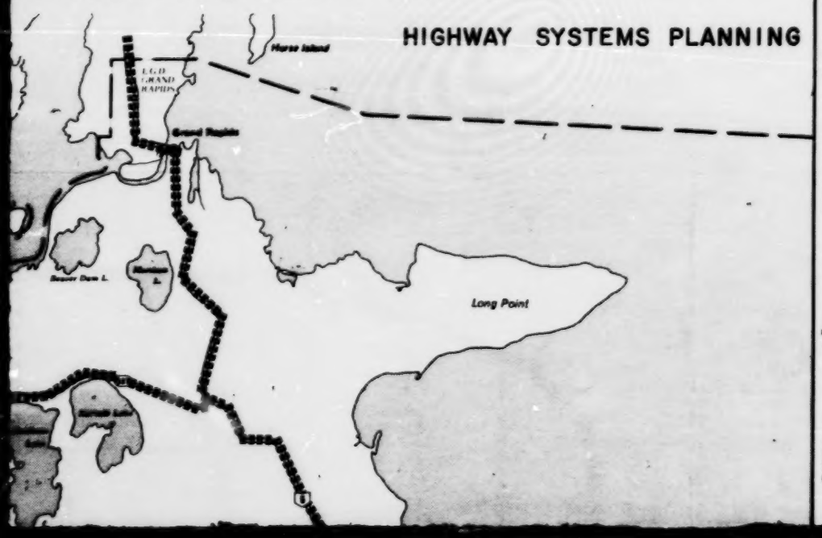
SCALE IN MILES 5 0 5 10 15 20

SCALE IN KILOMETRES 8 0 8 16 24 32

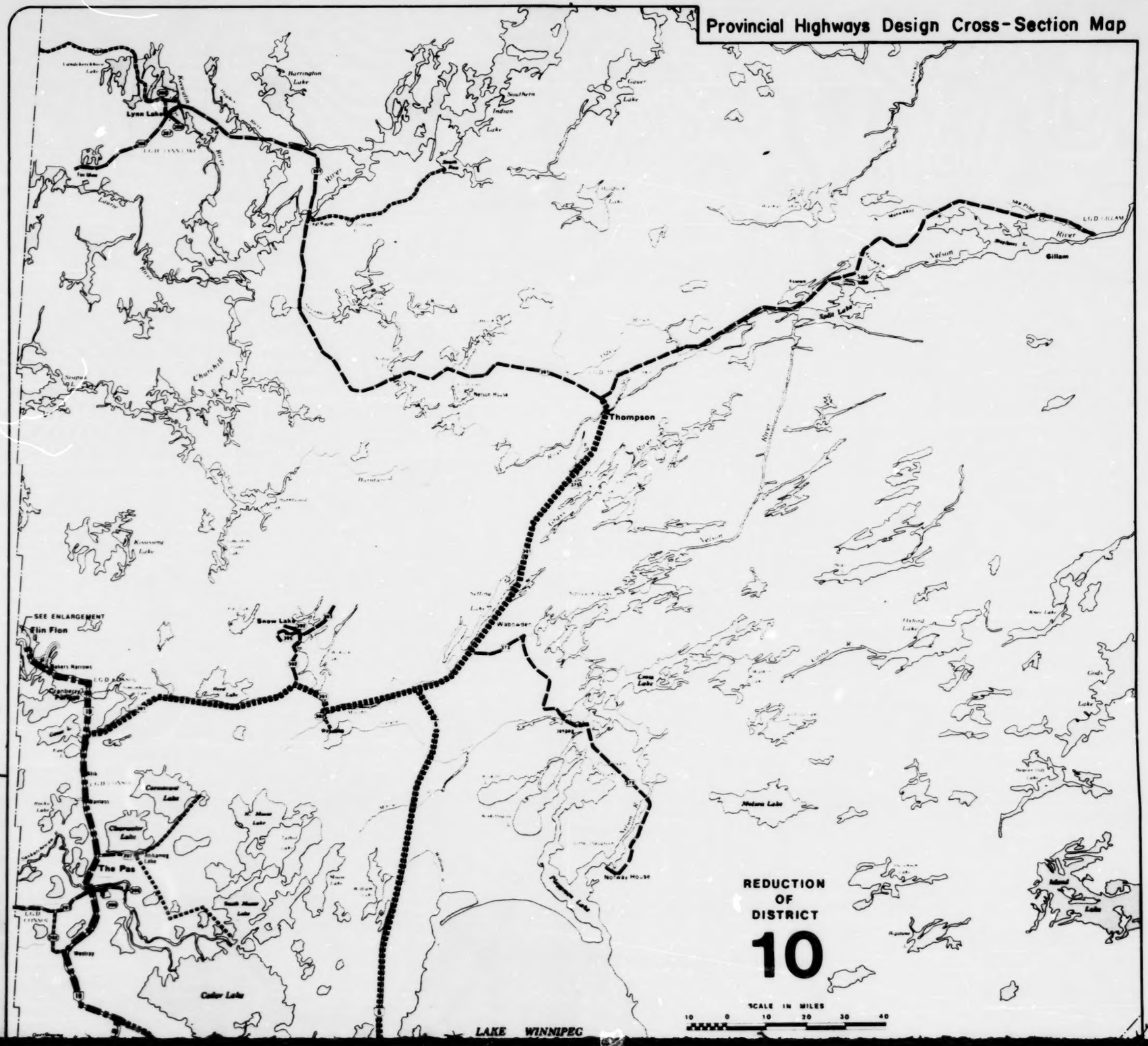
NOTES:

1. The map has been based on 1984 traffic volumes and growth rates as predicted in that year.
2. Prior to finalizing design cross-section a review should be made to ensure traffic volumes and development conditions have not changed significantly.
3. This map is to be used in conjunction with Basic Design Standards for Provincial Highways.
4. The cross-sections are for rural highways with no constraints. In the case of development, terrain, soil condition and other constraints further study will be required.
5. Consider stage construction if surface treatment required in next 5-10 years or if the function of highway so warrants.

HIGHWAY SYSTEMS PLANNING



Provincial Highways Design Cross-Section Map



HIGHWAY SYSTEMS PLANNING

10

9

LAKE WINNIPEGOSIS

LAKE WINNIPEG

Cedar Lake

Overflowing R.

Overflowing River

Red Deer Lake

Red Deer R.

Westgate

Powell

Barrows

Baden

L.G.D. MOUNTAIN

Malonking

Armit L.

Sleepy Rock Lakes

Bell R.

Beltrite

Hovra

Birch River

Swan River

Minitonas

Bowsman

Lesswood

Swan R.

Durban

Benito

Wellman L.

Cowan

Sclater

Camperville

Duck Bay

Duck River

Pine River

Pulp River

Ethelbert

Garland

Mossey River

Chetwynd

Dauphin River

Spruce I.

Pelican Lake

Swan Lake

Birch Island

Waterhen Lake

Skownan

Waterhen R.

Waterhen

Whitewater Lake

Ochre L.

Island Lake

Pickerel L.

Stub L.

Steel L.

Kench Lake

Rainbow Lake

Beaver Dam L.

Marchen L.

Eastervile

Grand Rapids

Horse Island

Long Point

Rainbow Island

Steeprock R.

Steeprock Lakes

Swan River

Minitonas

Bowsman

Lesswood

Durban

Benito

Sclater

Duck River

Pine River

Pulp River

Ethelbert

Garland

Mossey River

Waterhen

Skownan

Waterhen R.

Whitewater Lake

Ochre L.

Island Lake

Duck Bay

Birch Island

Rainbow Island

Steeprock R.

Buggy Creek

Chetwynd

Armit L.

Sleepy Rock Lakes

Bell R.

Beltrite

Hovra

Malonking

Birch River

REDUCTION OF DISTRICT

10

SCALE IN MILES

10 0 10 20 30 40

SCALE IN KILOMETRES

16 0 16 32 48 64

LAKE WINNIPEG

LAKE WINNIPEG

ENLARGEMENT OF FLIN FLON AND AREA
(NOT TO SCALE)

ENLARGEMENT OF PORTAGE LA PRAIRIE
(NOT TO SCALE)

8

11

7

6

LAKE MANITOBA

DAUPHIN LAKE

LAKE MANITOBA

ENLARGEME
FLIN FLON AN
(NOT TO SC

ENLARGEMENT OF
FLIN FLON AND AREA
(NOT TO SCALE)

ENLARGEMENT OF
WINNIPEG BEACH AND AREA
(NOT TO SCALE)

11

1

6

LAKE MANITOBA

LAKE WINNIPEG

L.G.D. GRAHAMDALE

L.G.D. ALONSA

L.G.D. FISHER

Gypsumville

St. Martin

Lake St. Martin

Portage Bay

Fairford

Hilbre

Steep Rock

Grahamdale

Spearhill

Moosehorn

Ashern

Hodgson

Fisher Branch

Shoreditte

Riverton

Arborg

Eriksdale

Deerhorn

Lundar

Clarkleigh

Oak Point

Toulon

Gunton

Balmoral

Woodlands

Argyle

Warren

Stonewall

Selkirk

Lake Francis

Two Lakes Beach

St Ambroise

Lynch's Point

Delta Beach

Westbourne

Gladstone

Neepawa

McCreary

Alonsa

Amaranth

Glenella

Plumas

Eden

Ogilvie

Lakeland

Langruth

Tenby

Crane River

Eddystone

Ste. Rose du Lac

Ste. Amelie

Kinosota

Vogar

Mulvihill

Camper

Dog Lake

Rat and Plue Lakes

Mafeking

Broad Valley

Zbaraz

Moosehorn

Flin Flon

Lake Winnipeg

Moose I.

Fisher Bay

Kuistalan

Dallas

Pine Dock

Dear Island

Black Island

Hecla Island

Victoria Beach

Victoria Beach

Grand Beach

Grand Marais

Sandy Hook

Winnipeg Beach

← SEE ENLARGEMENT

Pine Falls

St. Georges

Great Falls

Lac du Bonnet

Pointe du Bois

Mangotagan

Bissett

Whitemud River

Manigotagan River

Wanipigow River

Black River

Hayes River

Gammon L.

Touch L.

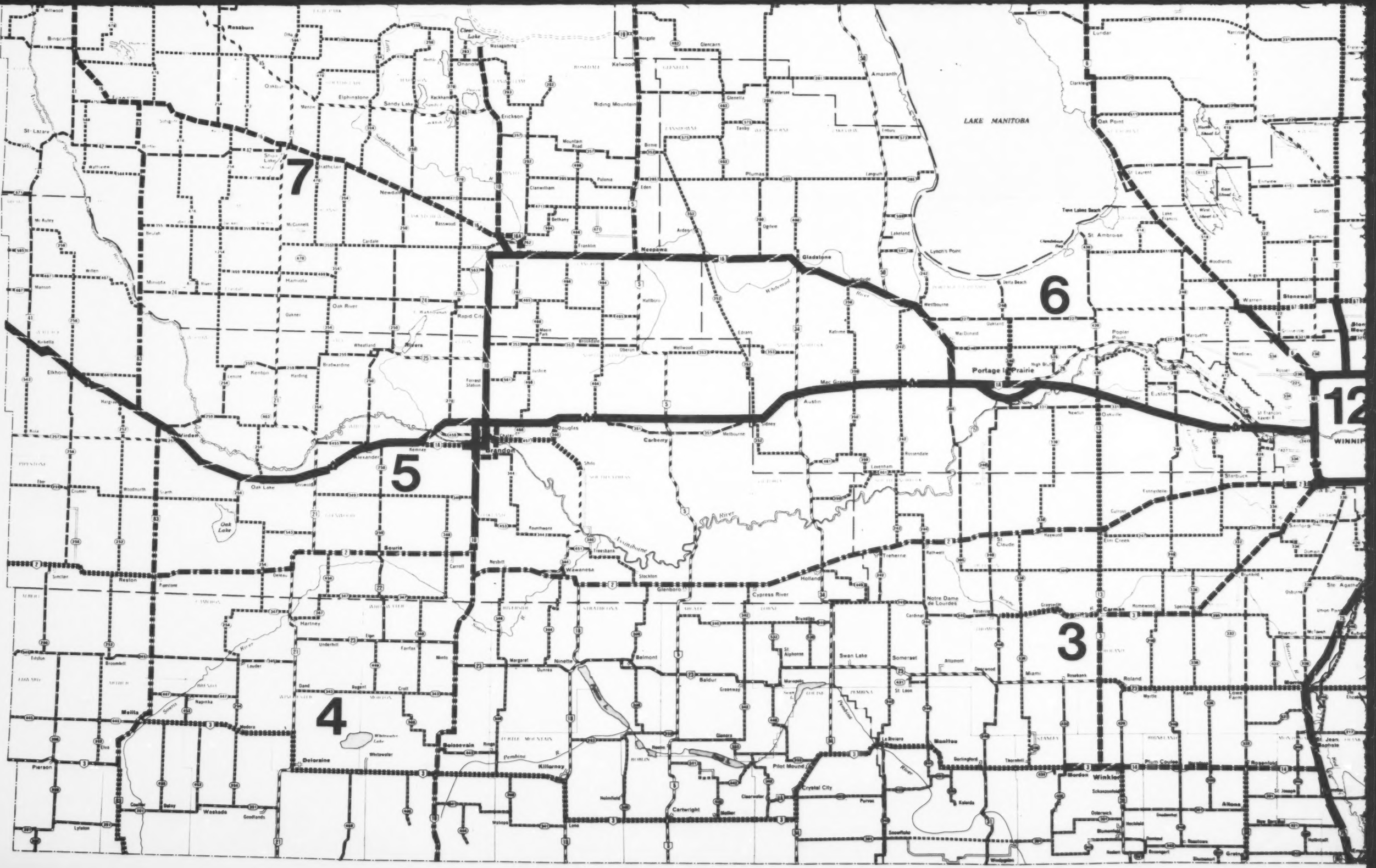
Flintstone L.

Wadsworth Lake

Albert Lake

Lac Lake

Whitemud River


7
5
6
4
3
12
LAKE MANITOBA
Brandon
Neepawa
Gladstone
Portage la Prairie
Souris
Killarney
Deloraine
Pilot Mound
Crystal City
Winkler
Morden
Carberry
Rivers
Minnedosa
Hamiota
Oak River
Rapid City
Virden
Elkhorn
Melita
Pierson
Boissevain
Reston
Hartney
Wawanesa
Glenboro
Cypress River
Treherne
Holland
Carman
Roland
Miami
Somerset
Swan Lake
Baldur
Belmont
Glenora
Carberry
Douglas
Oak Point
Lundar
Eriksdale
Ashern
Moosehorn
Dauphin
Russell
Minnedosa
Rivers
Brandon
Souris
Killarney
Deloraine
Portage la Prairie
Winkler
Morden
Carman
Roland
Somerset
Swan Lake
Baldur
Belmont
Glenora
Pilot Mound
Crystal City
Treherne
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Glenboro
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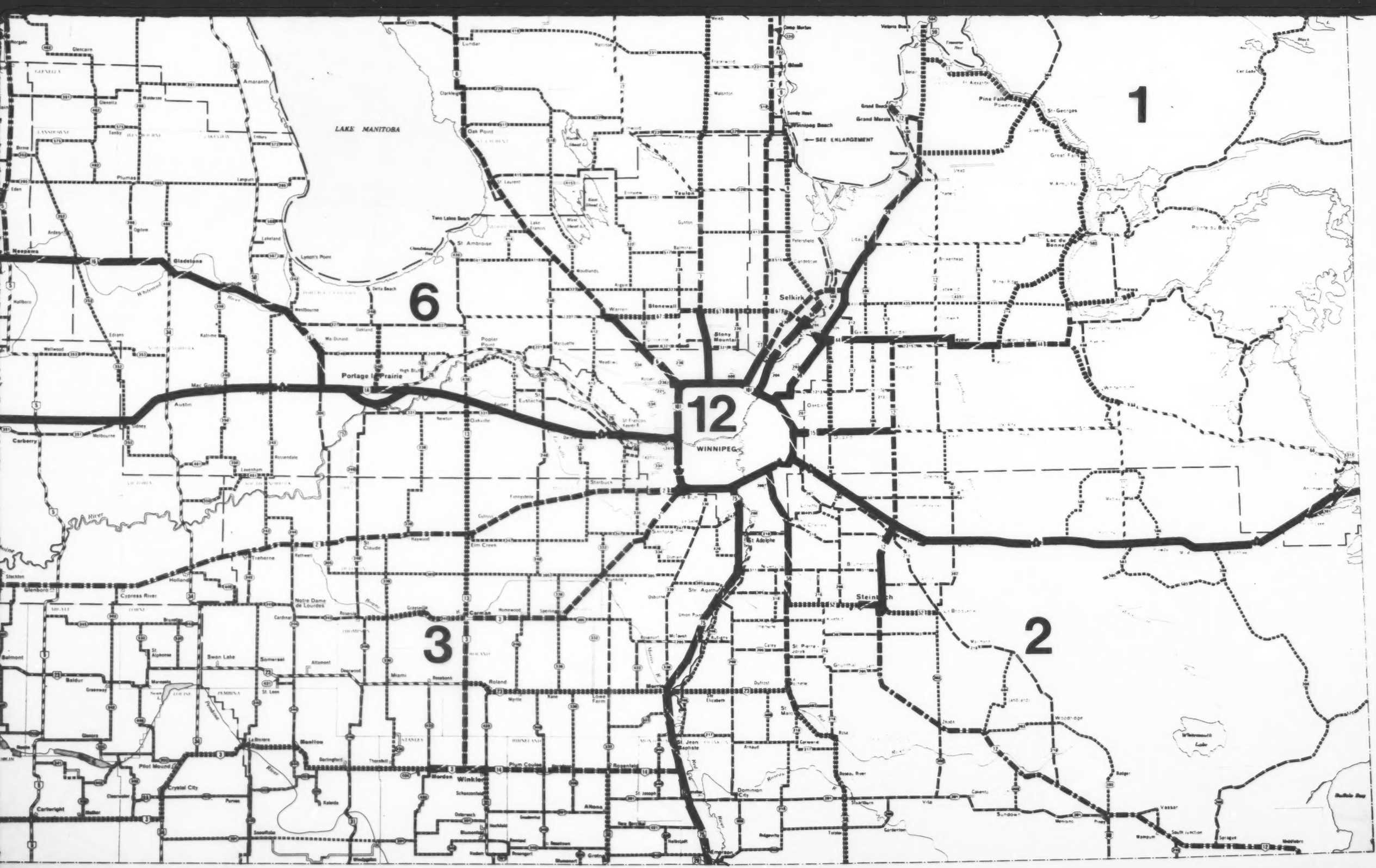
Wawanesa
Hartney
Reston
Melita
Pierson
Boissevain
Deloraine
Killarney


LAKE MANITOBA
SEE ENLARGEMENT
WINNIPEG
1
2
3
6
12
Portage la Prairie
Gladstone
Neepawa
Carberry
Austin
Mac Gregor
Plumas
Amaranth
Glenboro
Cypress River
Pilot Mound
Crystal City
Winkler
Morden
Carman
Treherne
Baldur
Miami
Roland
Stonewall
Selkirk
Stony Mountain
Teulon
Two Lakes Beach
St Ambroise
Lynch's Point
Delta Beach
Oak Point
Lundar
Eriksdale
Ashern
Fisher Branch
Grand Rapids
Pine Falls
St-Georges
Great Falls
Lac du Bonnet
Pointe du Bois
Steinbach
St Adolphe
Ste Agathe
St Pierre-Jolys
Dominion City
St Jean Baptiste
Sprague
Vassar
Whitemouth Lake
Woodridge
Sundown
Sharlburn
Gardenton
Emerson
Altona
Rosenfeld
Plum Coulee
Elm Creek
Starbuck
St Claude
Notre Dame de Lourdes
Swan Lake
Somerset
Manitou
La Riviere
Boissevain
Souris
Virden
Hamiota
Minnedosa
Rivers
Brandon
Portage
Westbourne
Neepawa
Gladstone
Minnedosa
Hartney
Melita
Deloraine
Boissevain
Virden
Souris
Brandon
Rivers
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